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N. E. L. A. Work with Small Companies

EARNEST development of the National Electric Light Association affairs in the interest of small companies, as suggested by President Lloyd in the interview in last week's issue, represents a progressive and commendable move which will receive hearty support from all active organization workers. The problem of enlarging close co-operative relations with small companies is the problem of the associations in each public utility industry. One reason why this problem exists is the remoteness of many small properties from large centers. Officials of plants with light gross revenues and smaller divisible earnings have little money to spend on trips to far-distant association meetings. The N. E. L. A. has met this feature of the problem wisely by successful union with State sectional organizations. For the intensive work among small companies the association will always have to depend largely upon sections, and it is unfortunate that if their work is ineffective the national body loses the benefit of the close-knit formation which is productive of best results. The movement to co-operate strongly with small companies for the common advantage of all is dependent upon officials of sections, and it is important, therefore, that they appreciate the largeness of the opportunity and cordially embrace it.

Electrical Equipment of a Dental Infirmary

THE ordinary person associates the use of electricity by dentists merely with a terrible buzzing device which has given him many unpleasant experiences. It will, therefore, be somewhat of a surprise to our readers to learn of the elaborate electrical equipment which has been found desirable in the Forsyth Dental Infirmary at Boston. This institution, which has been designed particularly to afford free dental treatment for children, is backed by an endowment of $2,000,000—a large philanthropy for pioneer work of this particular kind. The building is equipped with a steam-driven plant in the basement as well as with an emergency service connection from the central station. There are two 25-kw. sets, each of which is ordinarily able to handle the full day load. The equipment driven from this generating outfit is a very varied one. Installed in the main operating room are sixty-two motors for dental engines and, in addition, an individual lamp on each of the sixty-two chairs now in use, besides a complete annunciator equipment with four signal cords from each chair. However, this commonplace use of electricity in the operating room is only a small part of the service. There is a centrifugal pump for circulating warm water in the operating room, another for the hot-water supply of the lavatories, a pair of small blower motors for the sterilization ovens, another for the drill-cleaning equipment, half a dozen more for ordinary fan service, an ash-elevator motor, a motor-driven sump pump, a motor-driven set for the inside telephone service, a pair of pump motors for the air-washing service, besides a motor-driven lathe and a motor for the passenger elevators. This constitutes a noteworthy list for the incidental uses of the infirmary, which is also lighted from the same plant. The lighting is chiefly semi-indirect from alabaster bowls. Moreover an electric incubator is used in the laboratory, there is a completely equipped X-ray department, and an electric-clock system shows the time throughout the building. For a small plant it would be hard to imagine one performing more varied functions, and particularly doing more unexpected things from the standpoint of ordinary building service. It is an excellent example of the multifarious uses to which electricity is now being regularly put.

Central-Station Increases

OUR compilation of central-station increases in earnings and in output of electrical energy, published in this issue, covers April and May, 1915. We have completed a full year of the statistical work, and, while we regret that some companies still withhold their figures, we are confident that in publishing as full and representative totals as we are able to get we render a very useful service to our readers. The returns published in this issue cover 64 per cent of the central-station industry for April and 58 per cent for May, the May compilation having been hastened a little in advance of the receipt of all of the reports in order that it might be presented at this time. With the heavy hand of the European war laid upon industrial activities in this country and the resultant enforced economies of the population, it is encouraging to find that central-station earnings make a record that accords with the usual high expectations. In the year ended April 30, 1915, according to the returns, gross income gained 5.3 per cent over the preceding year and the output of electrical energy increased 6.1 per cent. For the year ended May 31 income gained 4.9 per cent and the output of energy 5.3 per cent; this year, of course, lacked the heyday month of May, 1914, and included one more month of the war period. It will be observed that the yearly gains mentioned are close to the percentages of increase for April, 1915, 4.8 per cent income and 5 per cent output, and therefore in that month we were on substantially the same basis as the average showing

for the year. Any improvement from that month is decisive gain; and while the percentage gain in income in May showed only slight improvement over April, the percentage gain in the output of kilowatt-hours doubled. Undoubtedly the speeding up of manufacturing plants on war-order business has helped the situation.

More Power for Vancouver

Our readers are more or less familiar with the active electrical development taking place in British Columbia, particularly in connection with the work of the British Columbia Electric Railway Company. The two plants described in the current issue are the latest addition to the resources of energy transmission on the mainland. Along the coast of North America for some distance north and south of Puget Sound lies a region of peculiarly high rainfall, about the highest on the continent. It is in just this territory that the Lake Buntzen watershed, utilized for these fine plants, extends. Moreover, the lay of the land is such that the generating stations are actually just above high-tide level on Burrard Inlet, about 14 miles from Vancouver. The distance from power house No. 1 to the dam which impounds the resources of Lake Buntzen is less than half a mile, and the water is conveyed from its 400-ft. drop in steel-pipe lines of the ordinary sort. The power house itself contains 11,000 kva. in generators, arranged in seven sixty-cycle, 2200-volt units. Energy is transmitted from the plant at an emf. of 34,600 volts obtained from transformer banks in another building.

The second of the stations is particularly interesting from the hydraulic standpoint. It utilizes a fall of the same height as the first power house, from which it is less than half a mile distant. Here, however, the water is carried in a tunnel in the lake for about 2000 ft. to a surge tank on the top of the cliff above the power house. In the station are three 9000-kva. generating units, driven at 200 r.p.m. by an impulse-wheel system consisting of four runners yielding in all 13,500 hp. All four runners, together with the rotor of the generator, are carried by a single hollow nickel-steel shaft more than 50 ft. long. Each of the three pipe lines divides into four branches, one branch per wheel unit. On each branch there is a hydraulically operated gate valve which controls the water to the nozzles, while the nozzles themselves are opened and closed in the ordinary way by the waterwheel governor. There are three exciter units, each consisting of a 300-kw. generator, driven by a water turbine and also coupled to an induction motor at the other end of the shaft so that either water or electric drive is available for each exciter.

On account of the particular combination of power and speed desired, the hydraulic arrangements of the plant look somewhat complex, but they really amount to the duplication of very simple units put together as a matter of convenience. There is nothing in particular to be noted as regards the switchboard and transformer plant here, save the very complete system of electric control operated from a bench switchboard with a model of the busbar system. Close to the operating board is a bank of recording thermometers, one for each transformer, to enable the closest possible track being kept of what is going on inside the big cases, and from this board also the water-cooling supply for each transformer may be regulated. The two stations herein described are operated together from a line extending between them, and unite in feeding energy to two circuits carried on steel towers which distribute it over a territory of some 1600 square miles.

The Common Denominator of the Commercial Vehicle Problem

Automobile transportation in some form or other is bound to come in the United States. During this next year the electrical industry faces an unprecedented group of conditions. Unless the industry as a whole realizes the gravity of the situation and agrees at once on a plan for extending the knowledge and the use of electrically driven vehicles among possible purchasers of such equipment, an opportunity will be lost which it may never be possible to regain.

The European war has given a tremendous impetus to the building of gasoline-engine-driven trucks in the United States. The demand for these trucks has induced manufacturers in this country to add to their investment in buildings and equipment. When the war is over they will turn to the domestic market to provide an outlet for the increased product which war conditions have made possible. This will undoubtedly mean that the merchandising ability of the gasoline-truck manufacturers will be turned to the marketing of trucks in a way never before attempted. The prospective purchaser of an automobile truck will have forced upon his attention the merits of the gasoline-driven machine as its maker sees them.

It is apparent, therefore, that now is the strategic time for every manufacturer of electric-truck equipment and every central-station manager to focus the attention of the users of electric vehicles upon the advantages of the electric truck. It should be clear that the interests of the manufacturers and the central stations are identical. The possibility of increasing and diversifying the central-station load by the addition of a group of electric vehicles is well known to the central-station manager. In the past some confusion has arisen between the electric-vehicle manufacturer and the central station as to the responsibility of each in extending the use of electric trucks. It would seem possible to iron out these differences in the face of a common danger. The problem of marketing electric trucks is not a question of just what the relations are to be between the central station and the manufacturer, but what the relation shall be between the user and the manufacturer who sells the truck and the central station that collects monthly for the energy by which the truck is operated. Let both manufacturer and central-station manager, therefore, keep in mind

the needs of the user. Let the manufacturer and central station each realize that the common denominator of their mutual problem is the user. The manufacturer must make his plans knowing that he must depend on both the central station and the user in any successful extension of his market. And the central-station manager must recognize that his income from the sale of electric vehicles comes only when he knows what the manufacturer has in detail to offer the user—the final customer of both.

Some Aspects of Lighting Legislation

The Wisconsin Industrial Commission made a progressive step forward in 1913 when it issued its bulletin of shop-lighting orders. In a few other states some efforts have been made in this direction, but as yet the legislation on factory lighting has been in the main more or less unsatisfactory. In addition to legislation, several other incentives are helping to influence factory owners to make much needed improvements. Among these other influences is that of the resulting economies which always accompany improved lighting under factory conditions. In a certain sense public opinion has also had its effect on executives and managers in opening the way for general attention to shop environment and its bearing on production efficiency, while the importance of adequate light both natural and artificial in its tendency to reduce accidents has come to be a recognized factor in shop management, this being, of course, specially noticeable in those states having compensation laws.

Legislation comes in as a compelling influence through the law to cause the industries to abide by certain regulations drafted to place all factory lighting on at least a standard minimum basis. With the obvious good points attending the efforts to legislate, better results will doubtless be forthcoming through the general tendency to popular and individual education which leads to an appreciation of adequate illumination and which further leads to definite improvements because of economic returns and accident reduction. Legislation must naturally be relied upon, and becomes necessary to maintain a certain minimum standard of lighting practice and to require of the ignorant and neglectful adherence to this standard. These observations are verified when one considers the widespread adoption of standards of factory lighting in States not having legislative requirements which are materially higher than those called for, for example, by the shop-lighting orders of the Wisconsin Industrial Commission. Lighting improvements have resulted in such cases, it is safe to say, from the growing understanding on the part of factory people of the returns which good lighting is capable of promoting in the better and larger product which usually follows a distinct change in factory environment. It would seem, therefore, that in the preparation of a factory-lighting code the specific orders can be made more valuable, and at the same time more readily enforced, if they are accompanied by explanatory notes of sufficient detail to make the orders themselves entirely clear to those who fall within the jurisdiction of the orders.

There seems to be a peculiar need at present for guidance where the drafting of such a code is attempted by State or municipal authorities. With good intentions, radical weaknesses can find their way into such articles of legislation. For example, a distinct weakness in the Wisconsin orders seems to be in a somewhat unfortunate manner of expression. Thus in one of the requirements the illumination for ordinary shop work is set forth to be the equivalent of that produced by one candle-power hung 10 ft. above the floor for each 4 sq. ft. of floor area. Analyzing this, one of the main requirements, it follows that, if installed according to this stipulation without a reflector, a tungsten lamp may give a very inadequate result. Here the effect on the work in terms of actual illumination rather than the specification of so many candle-power overhead would certainly seem to be the point at issue. In fairness, it should be stated that the Wisconsin orders contain references to shades and reflectors, but these fall under appended notes which tend to reduce the important influence they bear to the useful illumination.

By the nature of the conditions it must be designed to cover, the preparation of a factory lighting code becomes a very complex and difficult problem. The variety of factory spaces is so enormous and the differences sometimes so slight, in spite of their importance, that it is doubtful whether a set of rules can ever successfully be developed to cover every case. One way, however, in which to care for such a situation would seem to be the selection of typical cases, the code to apply to these, which in turn may be so distributed as to include the normal extremes. Expert assistance can well be called in where such legislation is to be enforced, and with such assistance any given factory section could readily be placed in its proper class whenever its identity becomes a matter of question. This would place the entire problem on an engineering basis, and the nature of the items involved would normally call for such a method.

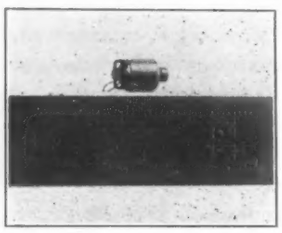
Among the most important features of lighting legislation in the future will probably be that of natural lighting, and in view of the general tendency to equip modern factory buildings with a large proportion of windows, such questions as the use of shades and awnings and the practical working intensities of daylight for various classes of work will undoubtedly form the basis of further investigation and discussion in this general connection. Similarly the intensities of artificial light should be classified according to the kinds and classes of work performed, due reference being made to the kind and arrangement of lamps suited to each condition. There seems, therefore, to be a wide field for the illuminating engineer in the assistance he can render where legislation of this nature is pending, and at the same time it seems apparent that the average factory owner will see for himself the many advantages of good light, which, when properly viewed, form an influence almost as great as, if not in excess of, that normally brought to bear by legal requirements.

LETTERS TO THE EDITOR

Another "Smallest Motor" from Hillsboro, N. D.

To the Editor of the ELECTRICAL WORLD:

SIR:—A motor which I have just completed weighs only 5.5 grains and is, I think, the smallest motor in the world. Its commutator, which measures 0.045 in. in diameter, is made up of four gold segments insulated from each other with mica. No glue or cement was used in its construction. The shaft on which the commutator is mounted is made of steel and is 0.009 in. in diameter. Fiber insulation is used between the commutator and the shaft. The tiny armature, 0.09 in.



A DIMINUTIVE GOLDEN MOTOR

in diameter, has four pole pieces and is wound with No. 40 silk-covered copper wire. The weight of the revolving part is 1.25 grains. Between the armature and the yoke two field coils are provided. The silver brushes measure 0.012 in. in diameter and are held against the commutator by springs 0.004 in. in diameter. In over-all dimensions the motor measures 19/64 in. long and 11/64 in. high. All visible parts are finished in Roman gold. When connected to a small flashlight battery the motor runs at a very high speed.

IVAN T. NEDLAND,
Hillsboro, N. D. *Jeweler.*

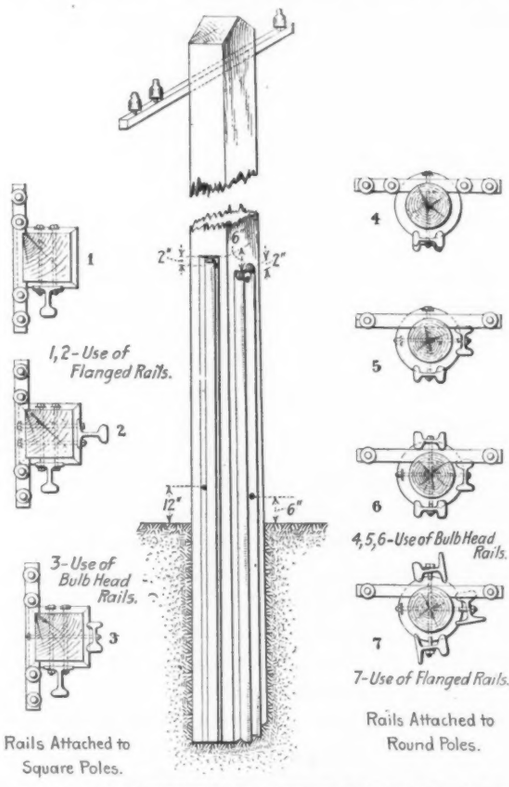
Reinforcing Wood Poles with Railroad Rails

To the Editor of the ELECTRICAL WORLD:

SIR:—On page 423 of the ELECTRICAL WORLD for Feb. 13, 1915, appeared a short article on "Protecting Pole Butts." It may be of interest to your readers to know how this problem is dealt with in far-away New Zealand.

I may prefix my remarks on this subject by mentioning that the lasting properties of the New Zealand timbers used for poles are fairly high. The wooden poles used are for the most part square, sawed, or hewed from heart timber. There are poles now carrying about a dozen No. 8 wires which were erected as far back as 1869, and which have had no supports or other treatment to prolong their life. The bulk of the poles, however, require some attention after standing from twenty-five to thirty years. Some twenty years ago the writer adopted a scheme of inserting short lengths of old railway rails at the base of defective poles to reinforce them. When this method is used a hole is dug alongside the pole the same depth as the original hole for the pole, usually from 4 ft. to 6 ft. The rail butt is then placed against the pole and secured by means of two $\frac{5}{8}$-in. bolts passing through the pole and holes drilled in the rail butt. One bolt is placed about 6 in. to 9 in. above the ground line, and the other about 2 in. from the top of the rail butt. These rail butts vary in length from 7 ft. to 15 ft., usually 8 ft. to 9 ft. for ordinary straight-line poles and 10 ft. to 15 ft. for angle poles. No hard and fast rule is followed in regard to the length or dimensions of these rail butts, as they are invariably scrap ends and a by-product of all railway systems. The weight varies from 40 lb. to 110 lb. per yd., the lighter weights being used for the smaller poles. Many thousands of our poles have been so treated at a cost of from one-sixth to one-tenth of the expenditure which would have been incurred had the poles been replaced by new ones.

This system of reinforcing standing poles obviously saves any refitting or alteration of line wires, and as the timber above the ground is probably good for a century, a pole with two rail butts attached to the base is practically stronger and more dependable than a new pole, although it may be thirty or forty years old. The method adopted is also a great relief to an overhauling foreman. When he must decide regarding a doubtful pole he does not need to consider whether or not to go to the expense of replacing it with a new one, for when in doubt he simply attaches a butt and passes on to the next pole. If the pole is in poor condition on account of decay, he usually uses two butts. In many cases a single butt has been inserted, and a dozen years or so afterward a second one is installed on the opposite side if the pole has deteriorated much in the mean-



WOOD POLES REINFORCED WITH RAILROAD RAILS

time. In numbers of cases the poles have completely rotted off at the ground line and are wholly supported by two rail butts. The accompanying diagrams show the methods of fastening rail butts to poles. For round poles bulb-head rails are preferable and flanged rails for square poles. The use of both types is shown in the illustration.

The writer believes the method outlined will be found more economical and reliable than that of incasing the base of the poles in concrete. It is also more flexible.

J. ORCHISTON, M.I.E.E.,
Wellington, N. Z. *Chief Engineer of Telegraphs for New Zealand.*

NAVY ADVISORY BOARD OF INVENTORS

Each of the Great National Engineering Societies Asked to Appoint Two Members to the Board

Secretary of the Navy Daniels announced on July 9 that he had invited eight well-known societies of the United States each to name two of its members for service on the naval advisory board of which Mr. Thomas A. Edison is to be chairman. Below are reproduced a letter written by Mr. Frank J. Sprague, New York, to Secretary Daniels on July 14 and the reply thereto, dated July 16, which throw considerable light on the subject:

NEW YORK CITY, July 14, 1915.

HON. JOSEPHUS DANIELS, Secretary of the Navy, Washington, D. C.:

SIR:—Permit me to congratulate you upon having decided to create a board of invention and development, to be aided by an advisory board of civilian engineers—a project the necessity for which I have long had in mind—and also for having been able to secure the co-operation of Mr. Edison.

The great necessity for and possible utility of such an organization cannot be better set forth than as stated in your published letter to him, for it is unquestionably true that the United States is woefully deficient, not alone in the actual preparation for defense, but in the knowledge of many things essential to it.

On account of the limitations in authority and expenditure and the routine hitherto pertaining to government matters, it has been almost impossible for men with meritorious inventions to have them properly considered, or even if considered to have them developed. It has, therefore, fallen upon many in civil life to help develop and finance inventions of this character. Since my own resignation from the naval service and the taking up of industrial development in the electrical field, I have had many matters presented to me which would have warranted thorough governmental investigation, and sometimes I have lent a hand.

I gather from your published letter that the proposed board is to be confined to the interests of naval development. As to this I may be in error, but in any case it seems to me that provision for investigation and possible experimental equipment should take into account the needs of both services, for not only are many inventions equally valuable for the navy and the army, but researches can be carried out jointly far more effectively and with material saving in expense.

I am, perhaps, not warranted in obtruding advice, but on account of the vital importance of the proposed undertaking, and because such measure of professional success as has come to me is largely due to my naval training, I will venture some suggestions:

First—In view of the confidential character of most of the communications to the board and the possible attitude of "hyphenates" in critical times, your advisers, whether men of purely civil education or men in civil life who have had the advantages of West Point or Annapolis training, should be dyed-in-the-wool Americans from birth up.

Second—With sane inventors there should be included men who are also engineers dealing with construction problems, and who can pass upon the practicability and value of inventions in the same manner as they now do for great commercial organizations—an essential if the highest efficiency is to be attained.

With regard to this latter suggestion it might be well to call into preliminary consultation the presidents of the various national, and perhaps some other, engineering societies before making a final selection. These include in their membership most of the prominent engineers and inventors in the country, the men on whose work much of our great industrial development has been founded.

Among these societies are the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the Mining and Metallurgical Society of America, the American Institute of Consulting Engineers, the American Chemical Society, the Inventors' Guild and the New York Electrical Society.

As a past-president of three of these I feel warranted in expressing the opinion that if the present presidents were requested by you to discuss the formation and membership of the proposed advisory board, and were asked to submit a number of names whom they could recommend for consideration as members, they would be glad to comply with your request. The practical advice of, for example, such men as Paul Lincoln of the Westinghouse Electric & Manufacturing Company and John J. Carty, chief engineer of the American Telephone & Telegraph Company, president and president-elect respectively of the American Institute of Electrical Engineers, would, I am sure, be invaluable.

Should the suggestions I have made be deemed worthy of consideration, and should you care to have them amplified, I am, of course, at your disposal either here or in Washington. Respectfully submitted.

FRANK J. SPRAGUE.

THE SECRETARY OF THE NAVY,
WASHINGTON, July 16, 1915.

MR. FRANK J. SPRAGUE, 165 Broadway, New York City:

DEAR SIR:—I have to acknowledge the receipt of your letter of July 14 and to thank you for your interest in regard to the matter of the proposed advisory board. I have carefully read your suggestions and am impressed by them, and will give them most careful consideration in this connection. Very truly yours,

JOSEPHUS DANIELS, *Secretary of the Navy.*

The eight societies asked by Secretary Daniels to nominate members for the advisory board are the American Society of Civil Engineers, American Chemical Society, American Institute of Electrical Engineers, American Institute of Mining Engineers, American Mathematical Society, American Society of Mechanical Engineers, American Aeronautical Society and the Inventors' Guild.

In his letters to the presidents of the respective societies Secretary Daniels said:

"A few days ago, as you have doubtless seen in the papers, desiring to make available the latent inventive genius of our country to improve our navy, I requested Thomas A. Edison to become chairman of an advisory committee of eminent men who would make up the committee. Mr. Edison, with the patriotism characteristic of American inventors, accepted the call to duty.

"I am writing to ask the membership of your society to give practical and valuable aid and needed co-operation by selecting representatives of its body to serve as members of the advisory committee. It is believed that the best results can be obtained only by such selection of the membership as will be representative of the inventive genius and scientific knowledge found in the membership of your kindred societies.

"Will you not, as president of your society, arrange to secure the selection of two of its members to serve on this advisory board? I feel that the work your society has done has been such as to give it the right to be in a way officially represented, and the Navy Department desires in this way to testify to its own appreciation of the splendid work for our country that your society has done. In addition, I feel that the judgment of your members as to who is best qualified among you to serve on this board will be far better than my own.

"I am going to ask you to take a poll by letter of your members, or in whatever way seems to you most certain of securing the men desired by the majority of your organization, to choose two of your members to serve on this board, and it will give me great pleasure when you have furnished me these names to extend to the gentlemen the formal invitation of the department.

"We are anxious to begin as soon as possible, and if your society can furnish me the names at an early date it will help the prompt organization of the advisory board very much. In adopting this course I have the emphatic approval of Mr. Edison, and he agrees entirely with me that your society should be represented in this way, and that no better method of getting the kind of men we need could be devised."

It is understood in Washington that the procedure of the proposed board is to be somewhat similar to that of the Commission of Fine Arts, composed of the foremost artists and sculptors of the country, who are asked for advice by all government departments and by the President on subjects connected with the fine arts with which the United States government is concerned. This body meets when it desires to do so and owes no responsibility to any one, although Congress makes appropriations for its expenses and provides it with quarters. No fees or salaries are paid the members of the fine arts commission, but no artist or sculptor has ever declined the honor of serving on the commission.

The naval advisory board is expected to develop gasoline motors for aeroplanes and engines for submarines of more efficient and powerful types than have yet been perfected in the United States, and also to devise means of defense for battleships against torpedo attack. Inventions along these lines are to be tested at the naval engineering experiment station at Annapolis, which is the right arm of the naval bureau of steam engineering for original research. It maintains a lubricant-testing laboratory, a corrosion laboratory for problems in corrosion of metals, a metallographic laboratory, and a physical laboratory for testing the strength and endurance of metals.

The Office of Naval Intelligence at Washington has been informed that Great Britain has formed a naval advisory board within the past week, to assist Admiral Lord Fisher, recently selected as chairman of the naval invention board. Eminent British scientists and inventors have been placed on the advisory board.

ILLUMINATING ENGINEERING SOCIETY

High Standard Set in Papers That Will Be Presented at the Annual Meeting to Be Held in Washington Next Month

The ninth annual convention of the Illuminating Engineering Society, which is to be held at the New Willard Hotel, Washington, D. C., Sept. 20-23 inclusive, promises to be the most interesting ever held by that body. Papers of an unusually high standard, dealing with illuminating engineering from various angles, have been selected and grouped for presentation at particular sessions. Ten sessions in all have been scheduled, nine of which will be apportioned equally between commercial, general and laboratory papers, while one session will be devoted exclusively to the presentation of papers dealing with problems of street lighting. In addition, there will be a preliminary session on the morning of Sept. 20, which will be given over to the formal exercises incident to the opening of the convention, to the presidential address of Dr. A. S. McAllister, and to reports of committees on lighting legislation, nomenclature and standards, and on progress. The tentative program of the convention is as follows:

Sept. 20—*Morning.*—Formal opening of convention; address of welcome, president's address, etc.; reports of committees on lighting legislation, nomenclature and standards, and progress.

Afternoon—General Session.—"Tests and Experiments in Connection with the New Commonwealth Edison Company Building," by Messrs. W. A. Durgin and J. B. Jackson of the Commonwealth Edison Company of Chicago; "Ship Lighting," by Mr. H. A. Hornor, New York Shipbuilding Company, Camden, N. J.; "Illumination Efficiency as Obtained in an Experimental Room," by Mr. Ward Harrison, National Lamp Works of General Electric Company, Cleveland, Ohio.

Evening.—Reception.

Sept. 21—*Morning—General Session.*—"Photometry with Portable Instruments," by Mr. W. F. Little, Electrical Testing Laboratories, New York; "New Test Plate for Illumination Photometers," by Dr. C. H. Sharp, Electrical Testing Laboratories, New York; "Incandescent Lamp Testing and Photometry," by Mr. G. W. Middlekauff, Bureau of Standards, Washington, D. C.; "Street Lighting," by Mr. F. A. Vaughn, consulting engineer, Milwaukee, Wis.

Afternoon.—Entertainment, trips.

Evening — Street-Lighting Session. — "Gas Street Lighting" (author not yet announced), Welsbach Street Lighting Company; "Arc Lamps for Street Illumination," by Prof. H. E. Clifford, Harvard University, Cambridge, Mass.; "New Types of Incandescent Lamps and Their Relation to the Street-Lighting Problems," by Mr. W. H. Rolinson, Westinghouse Lamp Company, Bloomfield, N. J.; "Ornamental Street Lighting," by Mr. T. I. Jones, Edison Illuminating Company of Brooklyn.

Sept. 22—*Morning—Commercial Session.*—"How to Attack a Lighting Problem," by Mr. W. R. Moulton, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.; "How Can a Combination Gas and Electric Company Render the Best Service to Customers?" by Messrs. S. B. Burrows and N. H. Potter, Public Service Corporation, Newark, N. J.; "Small Incandescent Lamps and Special Illumination Problems," by Mr. R. P. Burrows, National Lamp Works of General Electric Company, Cleveland, Ohio; "Lighting of Office Buildings," by Mr. A. O. Dicker, Commonwealth Edison Company, Chicago, Ill.

Laboratory Session.—"Crova's Method of Colored Light Photometry Applied to Modern Incandescent Illuminants," by Messrs. H. E. Ives and E. F. Kingsbury, physical laboratory of the United Gas Improvement Company, Philadelphia, Pa.; "Differences in Threshold and Acuity Variations," by Dr. P. W. Cobb, National Lamp Works, Cleveland, Ohio; "Visual Efficiency," by Messrs. F. K. Richtmyer and Howes, Cornell University, Ithaca, N. Y.; "Yellow Screens," by Mr. M. Luckiesh, Nela Research Laboratory, Cleveland, Ohio.

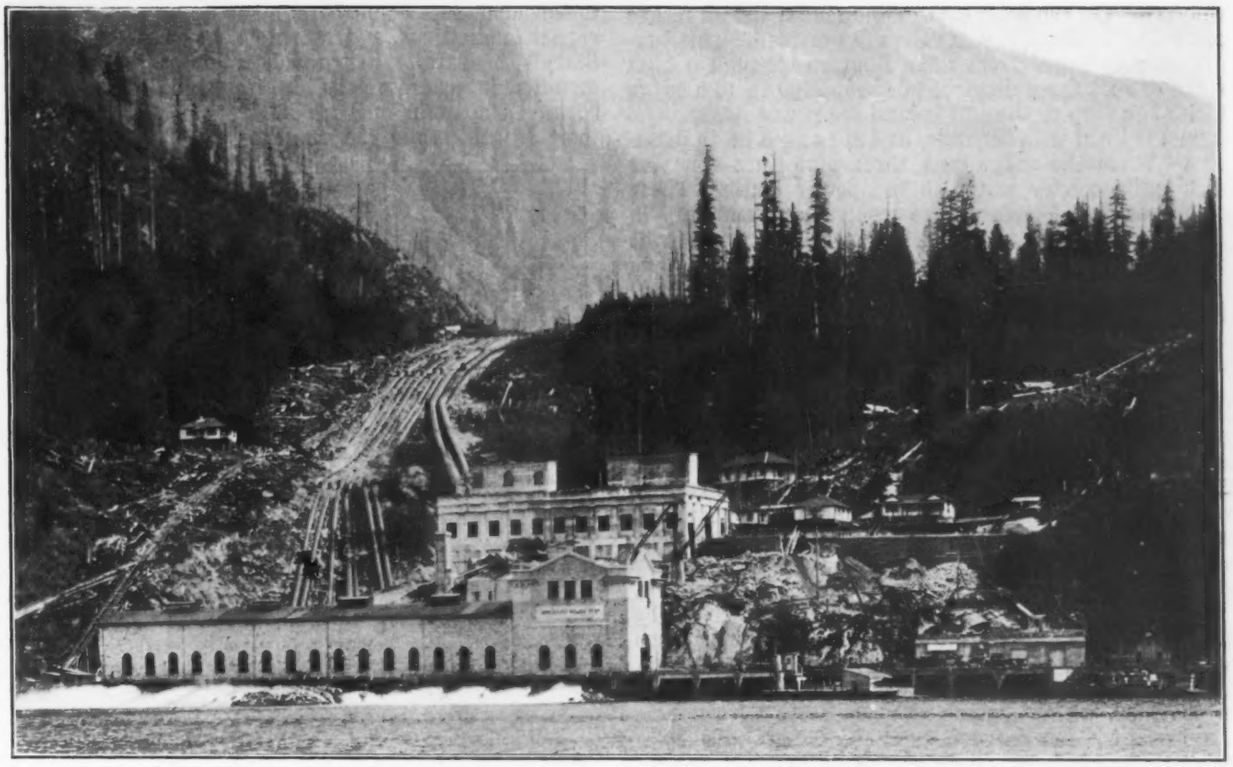
Afternoon—Commercial Session.—"The Flame-Pilot Ignition of Incandescent Gas Lamps," by Mr. C. W. Jordan, physical laboratory of the United Gas Improvement Company, Philadelphia, Pa.; "Practical Illumination as Exemplified by Some Recent Installations of Incandescent Gas Lamps," by Mr. R. F. Pierce, Welsbach Company, Gloucester, N. J.; "Mercury-Arc Lamps for Industrial Lighting," by Mr. W. A. D. Evans, Cooper Hewitt Company, Hoboken, N. J.; "Relation Between Proper Illumination and Accident Prevention," by Mr. R. E. Simpson, Travelers' Insurance Company, Hartford, Conn.

Laboratory Session.—"Retinal Sensibilities in Relation to Illuminating Engineering," by Dr. P. G. Nutting, Eastman Kodak Company, Rochester, N. Y.; "The Effect of Distribution of Light on Muscular Control," by Mr. H. M. Johnson, Nela Research Laboratory, National Lamp Works, Cleveland, Ohio; "Effect of Various Wave-Lengths of Radiation on Eye Cataract," by Prof. W. E. Berge.

Sept. 23—*Morning—Commercial Session.*—"Artificial Illumination of Interiors," by Mr. David Crownfield, Pettingell-Andrews Company, Boston, Mass.; "Lighting of State, War and Navy Building," by Mr. W. E. Chapman, assistant superintendent State, War and Navy Building, Washington, D. C.; "Lighting of Gymnasiums and Armories with Incandescent Lamps," by Messrs. A. L. Powell and A. B. Oday, Edison Lamp Works, Harrison, N. J.

Laboratory Session.—"The Effect of Surrounding Gas on an Incandescent Filament," by Mr. C. F. Lorenz, National Lamp Works of General Electric Company, Cleveland, Ohio; "The Parabolic Mirror," by Mr. F. A. Benford, Jr., General Electric Company, Schenectady, N. Y.; a paper (subject to be announced later), by Dr. C. E. Ferree, Bryn Mawr College, Bryn Mawr, Pa.

Afternoon—General Session.—"Artificial Illumination in Practical Photography," by Dr. C. E. K. Mees, Eastman Kodak Company, Rochester, N. Y.; "Photographic and Visual Illumination Efficiencies," by Mr. L. A. Jones, Eastman Kodak Company, Rochester, N. Y.; "Production and Application of Ultra-Violet Light," by Dr. M. Von Recklinghausen; "A Flux Method of Obtaining Average Illumination," by Messrs. F. A. Benford and H. E. Mahan, General Electric Company, Schenectady, N. Y.



Coquitlam-Buntzen Hydroelectric Development

Recent Addition to the Generating System of the British Columbia Electric Railway Company, Ltd., in the Vancouver District

THE British Columbia Electric Railway Company, Ltd., was incorporated for the purpose of operating the electric railways and for supplying electric light and power service generally in the vicinity of Vancouver, B. C., and of Victoria on Vancouver Island. Energy for these undertakings is obtained on the mainland from water-power plants Nos. 1 and 2 (Lake Buntzen) and from a steam turbine plant in Vancouver, and on Vancouver Island from the water-power plants at Jordan River and at Goldstream and an auxiliary steam-turbine plant at Brentwood Bay. Prior to the construction of these modern stations, steam plants, now obsolete, were operated in the cities of Vancouver and Victoria.

Since its inception, the growth of the company's business has been phenomenal, and the Vancouver steam plant and all of the water-power developments have been added to as the load conditions necessitated. The largest of the company's plants are those in connection with the Coquitlam-Buntzen water-power development.

Coquitlam-Buntzen Development

The Coquitlam-Buntzen development has for its main storage reservoir Coquitlam Lake. The original development works comprised the construction of a small rock-filled crib dam at the southern end of this lake, and the driving of a tunnel connecting Coquitlam Lake with Lake Buntzen, a small lake about 2000 ft. from the site of Plant No. 1. This tunnel is about 2½ miles in length; the area of its original cross-section was 81 sq. ft., and it was subsequently enlarged to an average cross-sectional area of 192 sq. ft. The precipitation over the Coquitlam Lake watershed is abnormally heavy, and, together with that from the Lake Buntzen watershed, the average run-off is about 1000 cu. ft. a second.

The construction of a hydraulic-fill dam 100 ft. in height at the site of the original Coquitlam dam made practically all of this run-off available for power purposes. A concrete dam 54 ft. in height at the north end of Lake Buntzen, built as part of the original development, provided a forebay for the plants, giving an effective head of 400 ft. at the power houses.

Station No. 1, Lake Buntzen

Plant No. 1, Lake Buntzen, with a total rating of 21,000 kva., is situated at sea level on the east side of the North Arm of Burrard Inlet, about 14 miles from the city of Vancouver and about 2000 ft. from the Lake Buntzen dam. Water is conveyed from Lake Buntzen to the power house through pipe lines of riveted steel construction as shown above.

The power house is built of hewn granite, and the equipment consists of four 1500-kva. units and three 5000-kva. units, generating three-phase, sixty-cycle current at 2200 volts, with the necessary low-tension generator and transformer switching equipment. In a separate reinforced-concrete building, which has recently been remodeled, are located three banks of three 3000-kva., single-phase, oil-insulated, water-cooled transformers, which step up the voltage from 2200 to 34,600. In another portion of the same building the high-tension transformer and line switches are placed, all of this equipment being suitable for operation at 60,000 volts.

Station No. 2, Lake Buntzen

Lake Buntzen power house No. 2 is situated at sea level about 1800 ft. south of power house No. 1, the water for operating it also being obtained from Lake

Buntzen. On the west side of the lake a tunnel intake controlled by three needle valves is provided. This tunnel conveys water from Lake Buntzen through a high ridge of rock for a distance of about 2000 ft. to a surge tank at the top of the cliff behind the power house. The tunnel is lined with concrete, and is 14 ft. 8 in. in diameter. From the surge tank three pipe lines—one for each unit—convey water to the power house. These pipe lines are of riveted steel construction, and vary in diameter from 8 ft. 6 in. at the surge tank to 7 ft. at the power house. Throughout their length the pipe lines are supported on concrete saddles, and about 200 ft. from the back wall of the power house they pass into tunnels. A butterfly valve is provided on each pipe line close to the surge tank.

On the main floor of the building, which is 5 ft. above high-water level, three units are installed. Each unit consists of one 8900-kva., three-phase, sixty-cycle generator of the revolving-field type, generating current at 2200 volts, direct driven at a speed of 200 r.p.m. by waterwheels made up of four runners, the combined rating of which is 13,500 hp. The generator and four water-wheel runners are all pressed on to a hollow nickel-steel shaft 51 ft. 3 in. long, forged in one piece.

Close to the back wall of the power house each of the three pipe lines divides into four branches, each branch supplying water to the two nozzles operating each runner; on each branch a hydraulically operated gate valve is provided, which controls the admission of water to the nozzles. The speed regulation is controlled by a Lombard governor which opens and closes the main nozzles according to the load on the unit, through links attached to a rocker-shaft, at the same time operating auxiliary relief nozzles when the load fluctuation is great. One relief nozzle is provided for each pair of runners.

Three exciter units are provided, one at the rear of each main unit. Each exciter set is made up of a 300-kw., 250-volt, compound-wound generator, driven direct by a 435-hp., 2200-volt induction motor. At the other

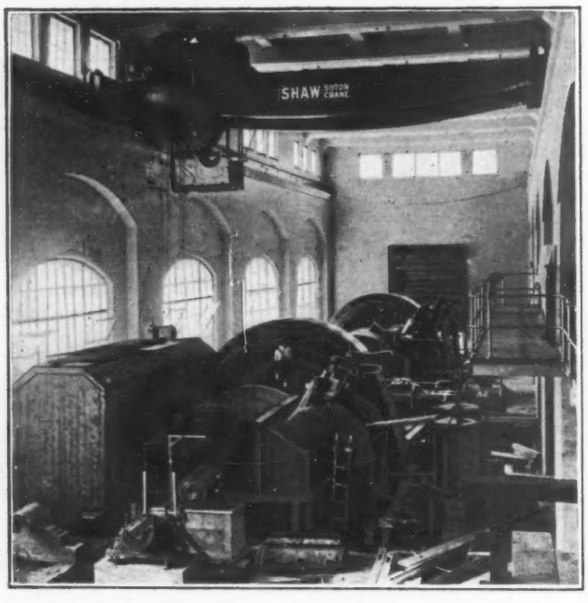


FIG. 2—INTERIOR OF LAKE BUNTZEN STATION NO. 2

end of the exciter shaft a 300-hp. waterwheel is provided. The water supply for each exciter waterwheel is obtained from the pipe line supplying the corresponding main unit.

The floor of the busbar room is at the same elevation as the generator room and immediately behind it. Two independent sets of busbars, made up of 6-in. by ¼-in. copper laminations, and known as the "main" and "auxiliary" busbars, are provided; these busbars are mounted in concrete cells on either side of the busbar room. The main busbars are continuous throughout their length, while the auxiliary busbars are divided

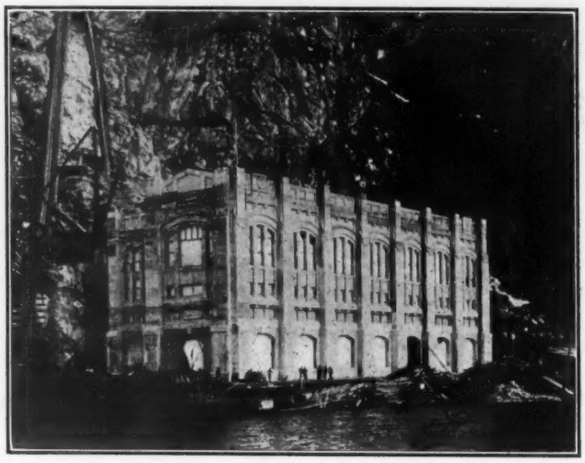


FIG. 3—LAKE BUNTZEN STATION NO. 2, BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY

into three sections which may be tied together by means of oil switches.

The low-tension generator and transformer switches are situated on a gallery above the busbar room. These switches are arranged in two rows back to back; one row is situated immediately above the main busbars, the other being over the auxiliary busbars. These rows of switches also contain the bus-tie switches and those for local service. The current-carrying capacity of the generator and transformer switches is 3000 amp. The busbars and low-tension switches are so arranged that the three generators may be operated as a single unit, or as two, or as three units, if desired. The direct-current switches are mounted on black-slate panels supported on pipe framework on the main floor of the power house below the operating gallery.

The transformer room is situated immediately above the low-tension switchroom. The equipment consists of four banks of three 3000-kva., single-phase, oil-insulated, water-cooled transformers, which at the present time step up the voltage from 2200 to the present transmission voltage, 34,600. At an early date the transmission voltage from both of the power houses will, however, be increased to 60,000.

Switching Equipment

The 60,000-volt switching equipment and the lightning arresters are placed in a large room directly above the generator room. These switches are ten in number and are divided into two groups of three and one group of four switches. The first two groups consist of a transformer switch, a bus switch and a line switch; the fourth switch in the third group is provided for connecting the fourth transformer bank direct to the high-tension busbars.

All of the low and high-tension switches are electrically controlled from a switchboard placed on a projecting gallery at the level of the low-tension switchroom about the middle of the back wall of the generator room. This switchboard consists of a control bench, above which instrument panels are mounted.

The instrument and bench panels are of black slate, and all of the indicating instruments with the exception of the synchroscope are of the horizontal edgewise type with dull-black cases. The benchboard is fitted with a

set of mimic busbars. The control switches are of the twin-button type fitted with red and green signal lamps. The control voltage used is 220 volts throughout.

A local service switchboard is provided at one end of the low-tension switch room, and a thermometer board is installed on the low-tension switch gallery close

FIG. 4—HIGH-TENSION SWITCHING EQUIPMENT, COQUITLAM-BUNTZEN DEVELOPMENT

to the benchboard. Twelve recording thermometers are mounted on the thermometer board, one for each transformer. The quantity of water supplied to each transformer may be adjusted from this board. Two Tirrill voltage regulators mounted on pedestals are provided beside the benchboard on the side remote from the thermometer board.

Two oil tanks for storing and handling oil for the transformers, and one tank for switch oil, together with the necessary pump, filter press, and electric oven, are provided on the generator-room floor at one end of the building. Two 50-ton electrically operated cranes, which traverse the entire length of the generator room, are provided. A 25-ton electrically operated crane is installed in the transformer room.

Three circuits leave the building from the back wall of the high-tension switch room. One of these lines ties together the two Lake Buntzen power houses; the other two circuits are carried on steel towers. These circuits, together with two circuits from No. 1 power house, feed the territory of 1600 sq. miles on the mainland within which the company operates.

Filament Size and Intensity of Projected Beam

In experiments reported by Mr. L. C. Porter, to show the effect of the size of the light source upon the resultant beam five lamps were made up, all of the same candle-power but of varying filament concentrations. Each lamp was focused in a parabolic reflector 11 in. in diameter and of 5-in. focal length, and the maximum beam candle-power measured as follows:

Lamp	Cp Beam
32-cp, 240-volt carbon, regular	265
32-cp, 240-volt carbon, stereopticon	555
32-cp, 120-volt carbon, stereopticon	1400
32-cp, 40-volt tungsten, special stereopticon	3335
32-cp, 6-volt tungsten, special stereopticon	3600

Mr. Porter emphasizes the importance of accurate focusing in dealing with concentrated light sources. Metal parabolic reflectors are well adapted to headlamp service, lenses being desirable for stereopticon and large searchlamp work. A larger percentage of the total light flux can be utilized by the parabolic reflector, and in general the shorter the focal length the more complete is the utilization, although this calls for a lamp of small diameter.

CENTRAL-STATION GAINS

Returns for Twelve Months Show Increases of 5 per Cent in Both Income and Kilowatt-Hour Output

During the twelve months ended April 30, 1915, the gross income from sales of electrical energy by the United States central-station utilities was 5.3 per cent more than during the previous twelve months and the kilowatt-hour output was 6.1 per cent greater, according to the returns received by the ELECTRICAL WORLD. For the twelve months ended May 31, 1915, the gain in income was 4.9 per cent and in output it was 5.3 per cent.

With the end of May ten months of the business unrest in this country caused by the European war were con-

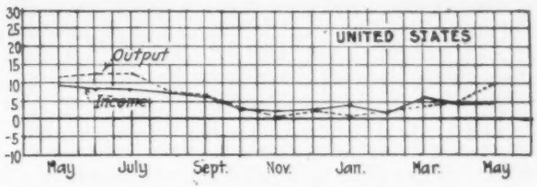


FIG. 1—CENTRAL-STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

cluded. The extent to which the utilities were affected is shown in the accompanying data. During the ten months the gain in income over the corresponding period one year earlier was 4.2 per cent and in output it was 3.8 per cent. In the first five months, or to Dec. 31, 1914, the gain in income was 4.8 per cent and in output of kilowatt-hours it was 4.4 per cent. The first five months of 1915 showed a gain of 3.9 per cent in income

TABLE I—CENTRAL-STATION RETURNS FOR THIRTEEN-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw-hr. Output		
		1914	1913	Per Cent Increase	1914	1913	Per Cen Increase
1914							
May.	45	$14,295,321	$13,099,007	9.1	674,877,591	602,832,337	12.0
June.	45	14,073,840	12,996,198	8.3	682,791,096	603,122,008	13.3
July..	50	14,086,822	12,970,325	8.5	735,937,850	649,720,026	13.3
Aug..	51	15,298,226	14,200,649	7.8	778,109,565	718,274,456	8.2
Sept..	51	15,708,695	14,694,205	7.0	782,450,267	733,754,420	6.8
Oct..	59	17,667,912	17,174,567	2.8	969,817,024	935,249,519	3.0
Nov..	65	19,777,650	19,260,451	2.7	986,456,324	978,934,946	0.8
Dec..	65	20,978,430	20,281,812	3.3	1,074,083,543	1,043,457,795	3.0
1915		1915	1914		1915	1914	
Jan..	65	21,582,547	20,697,423	4.1	980,085,036	966,200,323	1.4
Feb..	63	19,395,518	19,023,107	2.0	853,817,221	835,288,039	2.2
Mar..	64	18,654,443	17,529,054	6.4	939,117,179	896,903,968	4.8
April.	64	18,218,952	17,394,944	4.8	891,955,964	850,186,967	5.0
May.	58	15,572,323	14,843,853	4.9	770,661,444	701,302,431	10.0

and 3 per cent in output. In March, April and May the results were much better than was the case in the acute part of the period referred to.

Returns by Sections

The returns according to geographical sections show that New England properties have been affected least. Properties in towns and cities having a population of over 10,000 have continued to do well, and this is par-

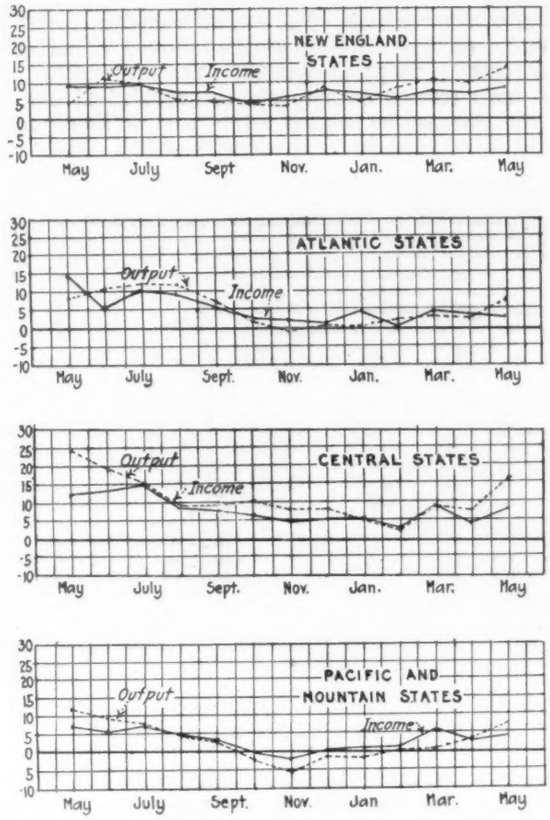
ticularly true of the larger places. In the very small towns, however, where generally prosperity depends to a large extent on one industry, the results are less satisfactory. In the Atlantic States the combined results have shown gains over the corresponding periods twelve months previous, but the rate of the gain has been reduced seriously. The kilowatt-hour output is beginning to show better increases, while for the last few months the gain in income has been between 2 per cent and 4 per cent. Companies in cities of over 100,000 inhabitants and those whose population is between 25,000 and 50,000 have suffered most. In the case of the cities with between 25,000 and 50,000 population, however, the cause is found mainly in the experience of one large company, the output of which was curtailed materially on account of legal requirements.

The gain in income in the Midde West properties has not been less than 3 per cent; in May it was 8.2 per cent. The gain in kilowatt-hour output reached a low level of 2.6 per cent, but it advanced to 16.2 per cent in May. With the exception of cities with between 50,000 and 100,000 population and those of under 10,000 the results varied little. In communities having a population of less than 10,000 a decrease was registered in both November and December, but the gain in May was approximately 20 per cent.

Since the beginning of the year the returns from the Far West have been decidedly better. During October and November decreases were shown, but in May the results were practically equal to those recorded before the war. Cities having a population of between 50,000 and 100,000 showed the best results. This was the only one of the groups that did not register any decrease in earnings, although in two of the months its output was 13 per cent less than that of the corresponding month a year earlier. In the other communities the results were variable.

Influencing Factors

Other factors besides the European war have influenced central-station operations. Jitneys, according to reports from the South, East and West, have made serious inroads on passenger traffic of electric railways, causing a reduction in the demand upon central stations. Rate reductions in some cities have reduced earnings. Some operators, in commenting on the reduction in income caused by the introduction of gas-filled tungsten lamps for street lighting, have expressed the opinion



FIGS. 2 TO 5—CENTRAL-STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A THIRTEEN-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States 1914	New England States 1913	Per Cent Increase	Percentage of Industry Represented	Atlantic States 1914	Atlantic States 1913	Per Cent Increase	Percentage of Industry Represented	Central States (Illinois Excluded) 1914	Central States (Illinois Excluded) 1913	Per Cent Increase	Percentage of Industry Represented	Pacific and Mountain States 1914	Pacific and Mountain States 1913	Per Cent Increase
INCOME	May	55	$1,745,160	$1,609,234	8.4	58	$6,492,767	$5,628,718	14.5	43	$3,200,553	$2,841,685	12.7	57	$1,525,729	$1,426,885	7.0
	June	58	1,560,872	1,442,178	8.3	54	6,067,780	5,578,311	6.0	52	3,914,836	3,459,497	13.2	67	1,804,887	1,791,918	5.8
	July	60	1,670,819	1,530,410	9.2	54	6,152,169	5,583,309	10.2	52	3,802,126	3,307,719	15.0	72	2,212,827	2,068,249	6.8
	Aug.	61	1,734,583	1,607,649	7.5	55	6,224,896	5,755,515	8.2	57	4,389,696	4,051,678	8.4	75	2,386,677	2,282,061	4.6
	Sept.	61	1,766,587	1,647,945	7.3	55	6,608,221	6,221,000	6.1	57	4,704,780	4,368,251	7.9	75	2,487,513	2,398,176	3.7
	Oct.	64	1,963,579	1,889,255	4.0	67	7,451,220	7,232,063	3.1	57	5,105,810	4,783,847	6.8	85	3,146,160	3,157,689	0.3*
	Nov.	67	2,229,742	2,115,957	5.6	69	8,373,772	8,157,966	2.7	57	5,408,672	5,158,981	4.8	88	3,503,499	3,574,086	2.0*
	Dec.	67	2,385,711	2,218,387	7.5	69	8,765,275	8,594,773	2.2	57	5,992,542	5,654,740	5.9	88	3,834,902	3,813,912	0.3
			1915	1914			1915	1914			1915	1914			1915	1914	
	Jan.	67	2,423,795	2,271,881	6.8	69	9,075,335	8,695,593	4.4	57	5,827,997	5,525,579	5.4	88	3,960,608	3,917,371	1.0
	Feb.	67	2,246,794	2,134,341	5.4	69	8,037,878	7,968,625	0.9	55	5,296,786	5,148,439	3.0	85	3,576,432	3,534,864	1.2
	March	67	2,146,032	1,999,326	7.5	69	7,777,126	7,419,808	5.2	55	4,885,384	4,465,728	9.5	88	3,605,893	3,412,842	5.8
	April	64	2,027,888	1,903,326	6.7	69	7,476,108	7,206,987	3.8	57	4,978,937	4,750,452	4.8	88	3,475,740	3,366,830	3.2
	May	64	1,925,543	1,786,531	7.9	63	6,658,796	6,491,530	2.6	43	3,615,366	3,224,735	8.2	88	3,368,704	3,220,255	4.6
KW.-HR. OUTPUT	May	55	52,752,247	50,779,103	3.9	58	259,098,542	238,733,320	8.4	43	202,611,026	162,363,929	24.8	57	144,839,552	129,357,915	11.9
	June	58	53,463,013	48,049,756	11.1	54	244,936,886	221,315,464	10.8	52	217,920,183	182,406,207	19.4	67	155,326,455	141,836,377	9.6
	July	60	54,074,533	49,255,893	9.8	54	263,580,290	235,068,939	11.8	52	217,928,950	188,569,581	15.6	72	183,160,015	169,718,387	7.9
	Aug.	61	55,801,224	52,913,483	5.4	55	264,717,319	237,984,895	11.2	57	267,501,400	226,276,638	9.4	75	193,216,699	185,330,705	4.2
	Sept.	61	55,525,272	53,267,877	4.3	55	270,974,533	252,648,550	7.3	57	260,705,339	237,832,934	9.7	75	190,979,705	185,090,658	3.2
	Oct.	64	67,520,070	65,068,938	3.8	67	358,458,539	351,362,247	2.1	57	295,490,712	266,827,567	10.5	85	245,966,868	252,047,828	2.4*
	Nov.	67	69,480,163	66,988,456	3.8	69	361,364,405	364,155,759	0.7*	57	290,681,750	269,220,528	8.0	88	255,651,947	269,467,354	5.1*
	Dec.	67	78,510,793	71,990,132	7.8	69	401,623,514	396,251,867	1.2	57	315,027,232	291,511,670	8.0	88	278,922,004	283,704,076	1.6*
			1915	1914			1915	1914			1915	1914			1915	1914	
	Jan.	67	72,550,608	69,317,803	4.7	69	374,972,536	373,336,906	0.7	57	272,623,760	258,372,903	5.5	88	252,531,483	256,198,272	1.4*
	Feb.	67	66,600,132	61,515,979	8.3	69	312,443,505	305,307,260	2.4	55	238,938,034	232,520,476	2.7	85	229,865,568	229,185,967	0.3
	March	67	72,121,319	65,343,335	10.5	69	346,341,496	335,506,429	3.3	55	257,136,231	235,656,647	9.2	88	255,529,704	253,423,951	1.0
	April	64	66,013,918	60,319,014	9.5	69	319,105,298	310,403,848	2.8	57	257,034,910	236,762,303	8.5	88	246,287,981	239,661,364	2.8
	May	64	65,516,997	58,006,215	13.0	63	297,525,619	276,244,731	7.7	43	148,868,273	128,058,629	16.2	88	254,382,182	235,913,688	7.9

*Decrease

that the better illumination afforded will help to build up other loads. Such accidents as fires and strikes were mentioned by two companies as reasons for decreases.

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED ACCORDING TO SIZE

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
INCOME:									
Group 1....	8.0	4.2	2.6	2.6	2.7	2.0	8.0	3.8	4.1
Group 2....	8.2	4.7	4.7	4.9	8.8	3.7	6.9	5.1	6.8
Group 3....	4.2	1.2	0.5	3.3	2.4	2.5	5.2	5.5	5.4
Group 4....	10.0	15.1	4.8	4.8	5.8	6.8	5.0	3.7	1.1
Group 5....	9.1	3.5	1.5	3.2	4.5	0.9	1.6*	1.8	5.2
OUTPUT:									
Group 1....	5.5	3.2	0.5	3.1	3.9	2.8	5.7	5.4	7.5
Group 2....	14.0	5.2	4.2	3.0	4.3	5.7	7.9	11.2	16.3
Group 3....	2.7	4.6*	7.2*	6.8	1.2	3.9*	3.6*	1.2*	6.0
Group 4....	9.5	6.3	5.7	9.2	9.0	5.5	3.2	3.3	30.9
Group 5....	4.0	2.9	2.6*	1.8	7.5	15.0	7.0	5.8	15.6

*Decrease.

From all sections the reports show increased earnings and output due to the more stable condition of industrial activity. Central-station managers generally

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
INCOME:									
Group 1....	5.8	5.0	6.1	7.9	7.1	5.7	6.6	6.3	9.4
Group 2....	6.3	2.3	2.3	5.5	6.2	4.1	9.0	4.1	8.0
Group 3....	7.0	6.1	9.7	11.4	7.5	0.7	7.8	20.6	9.2
Group 4....	3.9	5.8	9.0	8.2	8.9	9.4	6.5	8.4	6.2
Group 5....	17.8	8.0	3.9	5.5	2.1*	1.9	14.7*	0.4*	1.0*
OUTPUT:									
Group 1....	2.0	4.2	6.9	12.5	6.3	11.1	12.0	12.7	16.0
Group 2....	12.0	1.0	1.5*	5.9	5.4	6.4	12.3	12.3	21.5
Group 3....	7.4*	6.6	7.5	11.0	1.2	3.6*	0.3*	3.2	4.0
Group 4....	15.0	14.2	4.2	12.5	10.9*	9.4	12.5	11.5	6.0
Group 5....	9.7*	8.1*	8.3*	4.1	9.0*	6.1	29.8*	25.2*	13.5*

*Decrease.

predict improvement in earnings as a result of new motor loads and the gradual betterment of business. The reasons assigned for gains are war orders in New

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED ACCORDING TO SIZE

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
INCOME:									
Group 1....	7.8	6.2	3.0	1.6	1.3	1.3	4.7	1.6	1.8
Group 2....	6.1	7.1	2.7	3.9	5.0	4.2	7.1	5.6	7.2
Group 3....	7.9	1.4	0.3*	0.4	3.3	3.6	3.8	4.1	1.6
Group 4....	8.3	6.8	4.8	7.9	4.9	10.1	6.8	3.0	6.1
Group 5....	10.0	10.2	13.5	11.2	9.0	†	†	15.2	19.6
OUTPUT:									
Group 1....	7.1	4.6	0.0	3.2	1.7	3.0	6.1	4.8	8.2
Group 2....	15.6	10.3	5.0	4.3	3.1	7.0	9.7	7.6	10.4
Group 3....	16.4	6.0*	8.5*	7.7*	7.4	2.7*	8.5*	4.1*	3.2
Group 4....	2.2	0.0	3.8	6.2	7.8	6.3	10.2	2.1	23.3
Group 5....	26.8	46.5	57.5	11.1	13.5	†	†	57.2	71.5

*Decrease.
†Results omitted owing to insufficient returns.

England, mining and general industrial betterment due partly to war orders in the Middle West, the Exposition and crops in the Far West, and generally better conditions in the South. One company in New England reported that much of its gain arose from the opening of a summer seaside resort at an earlier date than usual. More people are patronizing American resorts this summer, and the manager of this company predicted a successful and long season for companies supplying such places.

The accompanying curves show graphically the percentages of growth given in Tables I and II. The groups in the remaining tables refer to companies operating in cities of different size. Group I refers to com-

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED ACCORDING TO SIZE

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
INCOME:									
Group 1....	7.7	7.0	4.7	5.2	6.1	3.5	10.1	7.3	9.9
Group 2....	9.5	4.7	5.2	7.5	4.3	1.4	5.9	3.7	4.2
Group 3....	0.0	4.0	4.0	7.5	2.1	6.2	11.3	10.4	14.0
Group 4....	11.3	8.1	4.3	6.4	3.6	6.0	8.3	7.2	8.2
Group 5....	9.5	1.6	0.5*	1.5*	3.7	2.8	7.7	7.6	19.9
OUTPUT:									
Group 1....	5.7	6.3	2.4	4.2	9.0	4.7	7.7	6.8	6.4
Group 2....	21.0	11.2	14.8	12.4	4.8	1.2	8.0	12.4	15.6
Group 3....	4.4	5.0	6.6	12.4	8.2	6.2	14.7	13.1	27.8
Group 4....	14.7	7.8	8.3	13.3	8.4	10.0	12.8	8.1	10.3
Group 5....	21.0	5.0	4.9	13.0	13.7	18.3	13.5	39.7	28.8

*Decrease.

panies in cities having a population of over 100,000; group 2, to those in cities having a population of between 50,000 and 100,000; group 3, between 25,000 and

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
INCOME:									
Group 1....	7.5	0.3*	2.4*	0.6*	1.6*	0.4	8.1	4.0	3.1
Group 2....	13.1	2.0	1.1	1.0	4.9	8.0	7.5	9.4	12.7
Group 3....	3.8	1.7*	3.5*	1.0	0.6	2.6*	1.0*	0.3*	3.4
Group 4....	17.7	2.9*	1.4	6.5	6.2	0.6	2.6*	3.8*	8.7
Group 5....	4.4	0.1	3.1*	2.5*	1.8	2.0*	3.5*	4.8*	4.1*
OUTPUT:									
Group 1....	2.3	1.6*	2.1*	0.0	1.5	0.5*	2.5	4.5	2.3
Group 2....	4.5*	13.6*	7.7*	13.0*	7.2*	13.5	3.0	11.6	19.0
Group 3....	2.7	7.3*	14.1*	14.2*	13.5*	11.5*	4.0*	3.5*	3.8
Group 4....	12.0	7.1	4.4	3.7	9.5	0.6*	9.5*	4.7*	87.0
Group 5....	7.2*	1.1	2.9*	1.0	4.1	9.9	18.0	25.5*	18.3

*Decrease.

50,000; group 4, between 10,000 and 25,000, and group 5, between 5000 and 10,000.

Columbus Municipal Plant Earns Profits

Messrs. Nau, Rusk & Swearington, accountants, Cleveland, Ohio, filed a report of their investigation of the affairs of the municipal light plant at Columbus, Ohio, with Mayor Karb on July 15. In arriving at the valuation it is claimed that every item included in the case of a private concern was considered. Rent for land occupied, taxes, water used, pro rata share of city administration expense, etc., were all taken into account as expenses, in addition to depreciation and the legal rate of interest on all indebtedness.

The total of the debit account is $1,301,078.56. Against this the plant is credited with the service furnished the city at the rate paid when the city purchased part of its energy or the cost in other cities since Columbus has been supplying its own service. To this amount was added the actual revenues from the sale of energy. The value of the service furnished the city from 1899 to Jan. 1, 1915, is estimated at $1,528,246.77, and since 1911 the receipts from commercial service have been about $45,000 a year. The report declares that the plant shows earnings of $213,326.

On the same day the Franklin County Court of Appeals sustained the decision of Judge Bigger of the Common Pleas Court, rendered some time ago, to the effect that the plant may sell its service below actual cost of production to secure customers.

Ornamental Street-Lighting Systems Compared

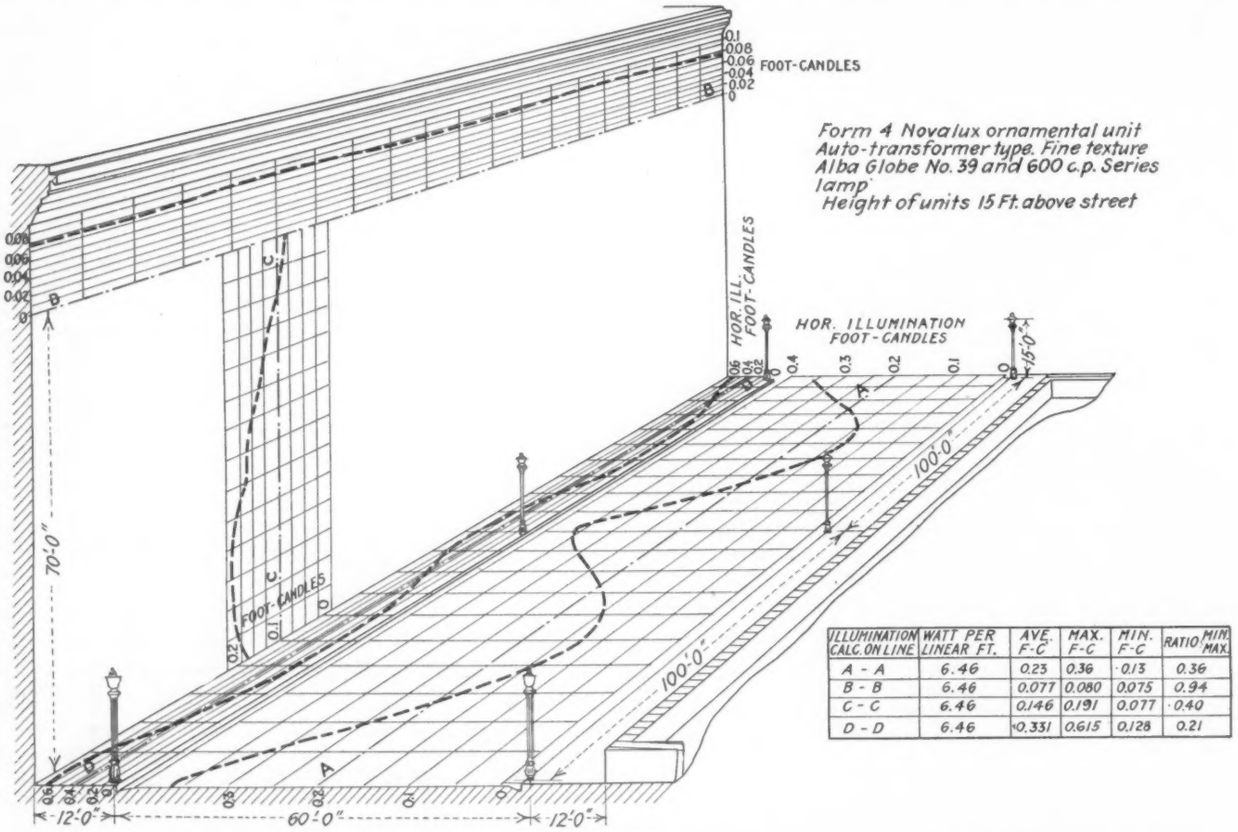
Relative Advantages of the Single Unit and the Cluster Analyzed from the Architectural and the Engineering Viewpoint

BY H. E. MAHAN AND H. E. BUTLER*

COMPARISONS of ornamental street-lighting systems must include an analysis of both the architectural, or esthetic, and the engineering features. One attempting to reach definite conclusions in a subject such as this will find his progress handicapped by the lack of definite standards by which to measure the various factors entering into the problem. The most one can do is to establish facts and thus make available information which will enable him to draw his own conclusions, attributing, in his opinion, the proper credit to these different factors. Other considerations demand the attention of the designer of an ornamental street-lighting system, such as the appropriation available for the work and the general character of the street—that is, the nature of the business establishments or residences bordering upon it, whether the street is used for commercial traffic or as a pleasure drive, whether it has shade trees, its width, etc. The degree to which these factors deserve consideration depends largely on local conditions, and no attempt will be made to discuss them here, as no purpose would be served except the expression of the authors' personal opinions.

The strictly architectural phase of the question also may be said to be to a great extent a matter of personal choice. No two designers would be likely to furnish the same design of standard, but it does not follow that they would condemn the design of a colleague. This leads one to believe that there must be some general rules which should be followed in order to satisfy architecturally the conditions of the problem. An effort to determine whether the single-light standard or cluster standard best meets the general conditions for ornamental street lighting has shown the single-light standard to be the favorite. It is claimed that the cluster adds too large a structure to the street, proving to be an obstruction and unsightly object; that the maintenance and initial cost of installation is high, and that outages have a very much more disturbing influence on the system as an ornamental whole, a partly illuminated standard being much more objectionable and noticeable than one entirely dark. In addition to eliminating the disadvantages of the cluster system the single-lamp standard presents a more dignified ornament, adding to rather than detracting from the general appearance of the street under both day and night conditions. Leaving the question of esthetics to be argued pro and con by those most qualified to do so, the engineering side of the question demands attention.

Engineering has to deal with the physical phases of the problem, which is capable of very accurate representation, and yet one finds among the profession an



ILLUMINATION CALC. ON LINE	WATT PER LINEAR FT.	AVE. F-C	MAX. F-C	MIN. F-C	RATIO MIN. MAX.
A - A	6.46	0.23	0.36	0.13	0.36
B - B	6.46	0.077	0.080	0.075	0.94
C - C	6.46	0.146	0.191	0.077	0.40
D - D	6.46	0.331	0.615	0.128	0.21

FIG. 1—GRAPHICAL REPRESENTATION OF INTENSITY OF ILLUMINATION ON STREET AND BUILDING SURFACES WITH SINGLE-LAMP STANDARDS

*Illuminating Engineering Laboratory, General Electric Company.

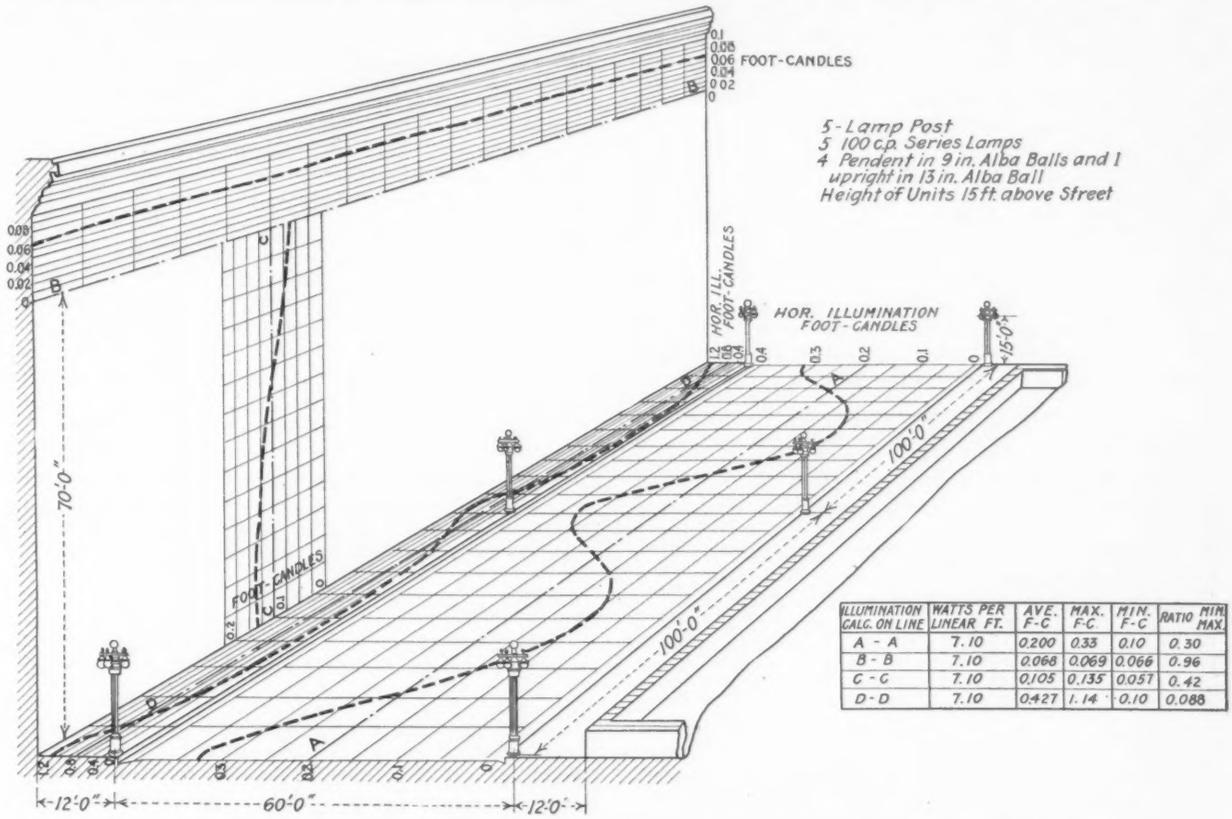
inability to agree as to what should and should not be. In investigating this branch of street lighting the authors have confined their consideration to the distribution of light, comparing equipments typical of the cluster and single-light systems. In arranging the charts, they have assumed that it is the purpose of an ornamental street-lighting system to distribute light on street, sidewalk and building façades. As a measure of how successfully these conditions are fulfilled, the illumination has been calculated along the following lines, as indicated in Figs. 1 and 2: Line *AA*, indicating the minimum illumination on surface of street. Line *BB*, indicating the minimum illumination on building façade. Line *CC*, indicating illumination on cornice of building 70 ft. above the plane of street. Line *DD*, indicating illumination along center of sidewalk.

The unit selected as representative of the single-light standard is the 6.6-amp auto-transformer type, 600-cp series lamp in a "Form 4 Novalux" ornamental unit with fine texture "Alba" globe. This unit is shown in Fig. 3.

The unit selected as representative of the cluster standard is the general form shown in Fig. 4, and consists of four 100-cp lamps inclosed in 9-in. "Alba" balls, pendent, and one 100-cp series lamp inclosed in a 13-in. "Alba" ball and mounted upright.

An examination of the table of Fig. 5 will show the relative values of the illumination from the two systems.

Fig. 5 shows the comparative distribution of candlepower in the vertical plane through the center of both the single-lamp and the cluster unit. From these curves it will be observed that the downward lumens (those effective in lighting the street) are the same in the two units, but the upward lumens (effective in lighting the building façades) are greater in the single-

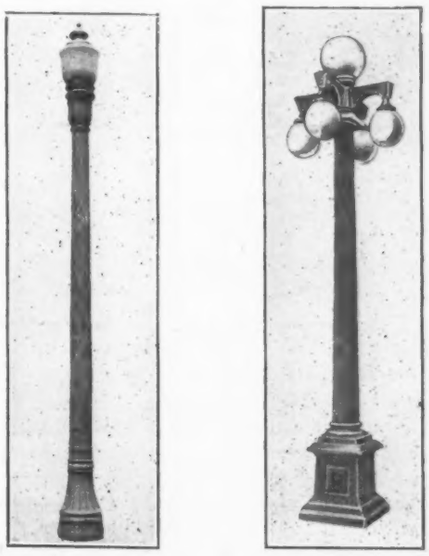


ILLUMINATION CALC. ON LINE	WATTS PER LINEAR FT.	AVE. F-C	MAX. F-C	MIN. F-C	RATIO MIN. MAX.
A - A	7.10	0.200	0.33	0.10	0.30
B - B	7.10	0.068	0.069	0.066	0.96
C - C	7.10	0.105	0.135	0.057	0.42
D - D	7.10	0.427	1.14	0.10	0.088

FIG. 2—INTENSITIES ON STREET AND BUILDING SURFACES WITH CLUSTER LIGHTING UNITS

TABLE I—VALUES ACTUALLY USED

Line	Watts per Linear Foot		Average Foot-candles		Minimum Foot-candles		Maximum Foot-candles		Minimum—Maximum	
	Cluster	Single	Cluster	Single	Cluster	Single	Cluster	Single	Cluster	Single
AA..	7.10	6.46	0.200	0.230	0.100	0.130	0.330	0.360	0.300	0.360
BB...	7.10	6.46	0.068	0.077	0.066	0.075	0.069	0.080	0.960	0.940
CC...	7.10	6.46	0.105	0.146	0.057	0.077	0.135	0.191	0.420	0.400
DD..	7.10	6.46	0.427	0.331	0.100	0.128	1.140	0.615	0.088	0.210



FIGS. 3 AND 4—TYPICAL SINGLE-LAMP AND CLUSTER ORNAMENTAL LIGHTING STANDARDS

lamp units. It is generally conceded that the most successful ornamental street-lighting system is one that illuminates the building façades and emphasizes the sky line of the buildings. Of course, a greater quantity of light flux could be turned upward from the cluster system by placing the lamps all upward, but the architectural appearance of the cluster is generally consid-

TABLE II—VALUES ON BASIS OF UNIFORM CONSUMPTION

AA..	1.00	1.00	0.0282	0.0360	0.0140	0.0200	0.0470	0.0560	0.300	0.360
BB...	1.00	1.00	0.0096	0.0119	0.0093	0.0116	0.0098	0.0124	0.960	0.940
CC....	1.00	1.00	0.0149	0.0226	0.0080	0.0119	0.0191	0.0296	0.420	0.400
DD..	1.00	1.00	0.0600	0.0510	0.0141	0.0198	0.1610	0.0960	0.088	0.210

The values in Table I on the basis of 1 watt per linear foot of street are shown in Table II. 100-cp lamp operated at a specific consumption of 0.71 watt per horizontal cp. Terminal watts 71. 600-cp lamp operated at a specific consumption of 0.50 watt per horizontal cp. Terminal watts, including loss in the auto-transformer, 323.

ered so inferior to the single-lamp standard that for building emphasis the latter is usually adopted.

The efficiency of the single-lamp standard as a whole, of course, would be necessarily higher for the reason that in the single-lamp standard a larger lamp, and

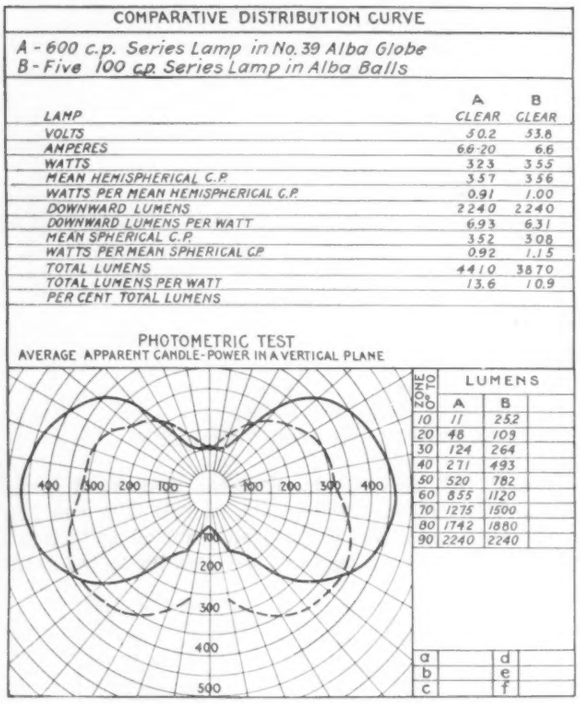


FIG. 5—COMPARATIVE CANDLE-POWER DISTRIBUTION CURVES

hence a more efficient one, may be employed than in the cluster of relatively smaller units. The efficiency of the cluster system also suffers through the interference of globes and pole and the consequent absorption of light.

The Office-Boy Problem in the Large Company

One large central-station company formerly employed in its general office a large force of boys to carry interdepartmental communications when summoned by means of a buzzer signal system. Having discarded the buzzer system, discharged more than half of the boys and put the remaining boys on regular routes through the office, the company now finds that its inter-departmental communication is increased in reliability and that the office-boy pay-roll is appreciably reduced.

The Receiving-End Impedance of a Conducting Line Loaded at Both Ends

BY A. E. KENNELLY

If a uniform conducting line BC (Fig. 1) has a total conductor resistance of R ohms and a total dielectric leakance of G mhos to ground, or to zero potential if a pair of looped lines are used, then it is well known that the line will possess, or subtend, a hyperbolic angle[1]

$$\theta = \sqrt{GR} \qquad \text{hyperbolic radians} \angle \quad (1)$$

and will offer, at and beyond any point, a characteristic resistance to ground of

$$z_0 = \sqrt{R/G} \qquad \text{ohms} \angle \quad (2)$$

In equations (1) and (2), as well as in those which follow, the quantities involved are "real" so long as continuous currents and emfs. are employed. In dealing, however, with impressed alternating currents in the steady state, the same formulas apply, but are interpreted vectorially, the quantities being all complex. Thus R, instead of being a simple ohmic resistance, becomes a conductor impedance varying with the impressed frequency; while G, instead of being a simple mhoic conductance, becomes a dielectric admittance, also varying with the frequency. We may, therefore, continue to discuss continuous-current cases, with the understanding that the formulas include alternating-current cases.

If the line BC is grounded, or shorted, at the receiving end C (Fig. 1) and is connected at the sending end to an emf. E_b volts, then the current I_c which will flow steadily to ground through the receiving end C is:

$$I_c = \frac{E_b}{z_0 \sinh \theta} \qquad \text{amp.} \angle \quad (3)$$

so that the receiving-end impedance of any single uniform line without terminal loads is

$$Z_l = z_0 \sinh \theta \qquad \text{ohms} \angle \quad (4)$$

Thus, if the line has a total conductor resistance R of 4000 ohms, and a total leakance $G = 10^{-3}$ mho, $\theta = 2$ hyps, and $z_0 = 2000$ ohms. Consequently the receiving-end impedance is $Z_l = 2000 \,.\, \sinh 2 = 2000 \times 3.6269 = 7253.8$ ohms.

If, now, the line, instead of being directly grounded at C, is connected there to ground through a terminal resistance z_r ohms, as in Fig. 2, then it is known that this load, when connected to the line, subtends an angle θ' hyps, determined by the relation:

$$\tanh \theta' = \frac{z_r}{z_0} \qquad \text{numeric} \angle \quad (5)$$

The position-angle δ_c at C is now increased by the presence of the load from 0 to θ' hyps; while the position-angle at B, or any intermediate point, is similarly increased by θ'. Thus, $\delta_b = \theta + \theta'$ hyps, as shown in Fig. 2. The receiving-end impedance is then known to be:

$$Z'_l = z_0 \sinh \theta + z_r \cosh \theta \qquad \text{ohms} \angle \quad (6)$$

$$= z_0 \frac{\sinh (\theta + \theta')}{\cosh \theta'} \qquad \text{ohms} \angle \quad (7)$$

In any alternating-current case (7) is much easier to deal with arithmetically than (6), being adapted to logarithmic treatment, or, for most practical purposes, to slide-rule treatment.

Thus, in the case of the line already considered, if $z_r = 500$ ohms, $\theta' = 0.2554$, $\theta + \theta' = 2.2554$, $\sinh 2.2554 = 4.7171$, $\cosh \theta' = 1.0328$, and $Z'_l = \dfrac{2000 \times 4.7171}{1.0328} = 9135$ ohms. With $E_b = 100$ volts, $I_c = 0.01095$ amp.

If, now, an impedance z_s is inserted at the sending

[1] "The Application of Hyperbolic Functions to Electrical Engineering Problems," by A. E. Kennelly. London: University Press, Chapter II.

end of the line (Fig. 3), between this terminal B and the impressed emf., E_a at A, the impedance of the line at and beyond B is

$$R_{gb} = z_0 \tanh (\theta + \theta') \qquad \text{ohms} \angle \ (9)$$

so that the total impedance at A of the line and sending-end load z_s is

$$R_{ga} = z_s + z_0 \tanh (\theta + \theta') \qquad \text{ohms} \angle \ (10)$$

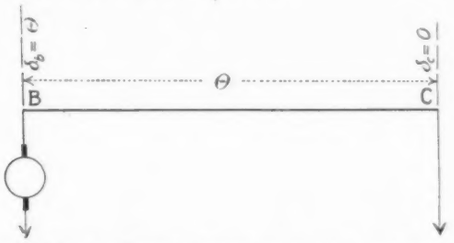


FIG. 1—SIMPLE UNIFORM LINE WITHOUT TERMINAL LOAD

whence

$$E_b = E_a \cdot \frac{z_0 \tanh (\theta + \theta')}{z_s + z_0 \tanh (\theta + \theta')} \qquad \text{volts} \angle \ (11)$$

and

$$I''_c = \frac{E_b}{Z'_l} = \frac{E_a \ z_0 \tanh (\theta + \theta')}{[z_s + z_0 \tanh (\theta + \theta')]z_0 \sinh (\theta + \theta')} \qquad \text{amp.} \angle \ (12)$$

Equations (11) and (12), or equivalents, have usually been employed in the case of a line loaded at both ends. But a much simpler formula may be used; because (12) will be found to reduce to

$$I''_c = E_a \frac{\cosh \theta' \cosh \theta''}{z_0 \sinh (\theta + \theta' + \theta'')} \qquad \text{amp.} \angle \ (13)$$

where

$$\tanh \theta'' = \frac{z_s}{z_0} \qquad \text{numeric} \angle \ (14)$$

Or, the receiving-end impedance of a line with two terminal loads is

$$Z''_l = z_0 \frac{\sinh (\theta + \theta' + \theta'')}{\cosh \theta' \cdot \cosh \theta''} \qquad \text{ohms} \angle \ (15)$$

a formula conveniently adapted to either slide-rule or logarithmic computation.

Thus, if z_s is 200 ohms, in the case already considered, $\theta'' = \tanh^{-1} 0.1 = 0.1003$, $\cosh \theta'' = 1.0053$, $(\theta + \theta' + \theta'') = 2.3557$, and $Z''_l = 10{,}066$ ohms.

As an actual alternating-current instance, for the data of which the writer is indebted to Prof. Carl Kinsley, a line subtends an angle of $\theta = 1.871 + j1.835$ hyps

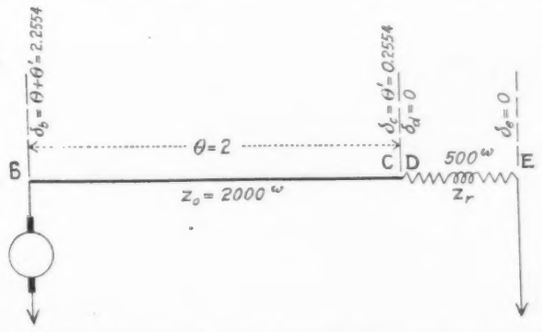


FIG. 2—SIMPLE UNIFORM LINE WITH RECEIVING TERMINAL LOAD

$= 1.871 + j1.168$, the underscored imaginary being expressed in quadrants, or radians $\times$ 1.5708. The line is shorted at the receiving end through 776.4 $\underline{|86°.55}$ ohms, and there is a sending-end load of 71.8 $\underline{|82°.8}$ ohms. The characteristic impedance of the unloaded line is 285.5 $\underline{|45°}$ ohms. Then $\theta' = \tanh^{-1} \left(\frac{776.4 \ \underline{|86°.55}}{285.5 \ \underline{|45°}} \right)$ $= \tanh^{-1} (2.719 \ \underline{|131°.55})$ and by chart[2] this is $\theta' = -0.23 + j0.820$, as indicated in Fig. 3. Similarly $\theta'' = \tanh^{-1} \left(\frac{71.8 \ \underline{|82°.8}}{285.5 \ \underline{|45°}} \right)$ $= \tanh^{-1} (0.2515 \ \underline{|127°.8})$ $= -0.149 + j0.128$, also by chart. Consequently, $\theta + \theta' + \theta'' = 1.492 + j2.116$. From the charts we find $\sinh (1.492 + j2.116) = 2.118 \ \underline{|168°.5}$, $\cosh \theta' = 0.363 \ \underline{|37°.8}$, and $\cosh \theta'' = 0.9912 \ \underline{|1°.75}$. The receiving-end impedance of the line with both terminal loads is, therefore, by (15),

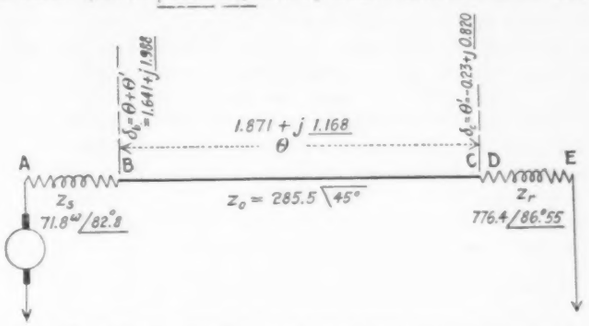


FIG. 3—SIMPLE UNIFORM LINE WITH RECEIVING AND SENDING TERMINAL LOADS

$$Z''_l = 285.5 \ \underline{|45°} \times \frac{2.118 \ \underline{|168°.5}}{0.363 \ \underline{|37°.8} \times 0.9912 \ \underline{|1°.75}} = 1680 \ \underline{|173°.95}$$

ohms. With an impressed emf. of 100 volts at A, of standard phase, the current received at E would be 0.0595 $\underline{|173°.95}$ amp.

Finally, in the case of a composite line with a plurality of component sections, each having its own characteristic angle and impedance, as indicated in Fig. 4, the receiving-end impedance, with a load at the receiving end only, is known to be

$$Z'_l = z_1 \sinh \delta_b \cdot \frac{\cosh \delta_d}{\cosh \delta_c} \cdot \frac{\cosh \delta_f}{\cosh \delta_e} \cdot \frac{\cosh 0}{\cosh \delta_g} \qquad \text{ohms} \angle \ (16)$$

If now a load z_s be added at the sending end, as in Fig. 4, and $\tanh \theta'' = \frac{z_s}{z_1}$; then

$$Z''_l = z_1 \frac{\sinh (\delta_b + \theta'')}{\cosh \theta''} \cdot \frac{\cosh \delta_d}{\cosh \delta_c} \cdot \frac{\cosh \delta_f}{\cosh \delta_e} \cdot \frac{\cosh 0}{\cosh \delta_g} \qquad \text{ohms} \angle \ (17)$$

Formula (17) bears the same relation to (16) as (15) does to (7), and if in (17) we make $z_1 = z_2 = z_3 = z_0$, or reduce the composite line to a simple line, (17) becomes identical with (15).

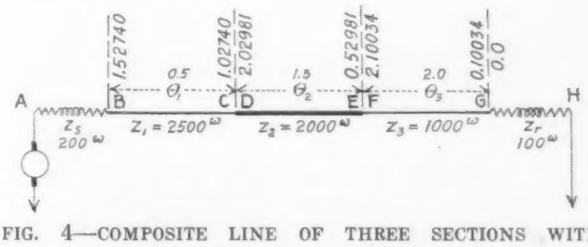


FIG. 4—COMPOSITE LINE OF THREE SECTIONS WITH RECEIVING AND SENDING TERMINAL LOADS

In the case presented in Fig. 4, when an emf. is impressed at A, the current is constant from A to B and again from G to H. Between B and G, in each section, the current at any point is directly proportional to the

[2] "Chart Atlas of Complex Hyperbolic and Circular Functions," by A. E. Kennelly. Harvard University Press.

cosh of the position angle of the point. The voltage falls steadily by Ohm's law from A to B, and again from G to H. Between B and G in each section the voltage at any point is directly proportional to the sinh of the position angle of the point.

With $\theta_1 = 0.5$, $\theta_2 = 1.5$, $\theta_3 = 2.0$, $z_1 = 2500\omega$, $z_2 = 2000\omega$, $z_3 = 1000\omega$, $z_r = 100\omega$ and $z_s = 200\omega$, the position angles of the section junctions are shown in Fig. 4. We then have $\theta'' = 0.08017$ hyp. and $Z''_l = 52{,}890$ ohms.

Summary.—A new formula is presented for the receiving-end impedance of either a simple or a composite line, when loaded at each end, which is nearly as easy to deal with arithmetically as the formula already known for the case of a receiving-end load only.

To Urge Government Control of Telephone and Telegraph Lines

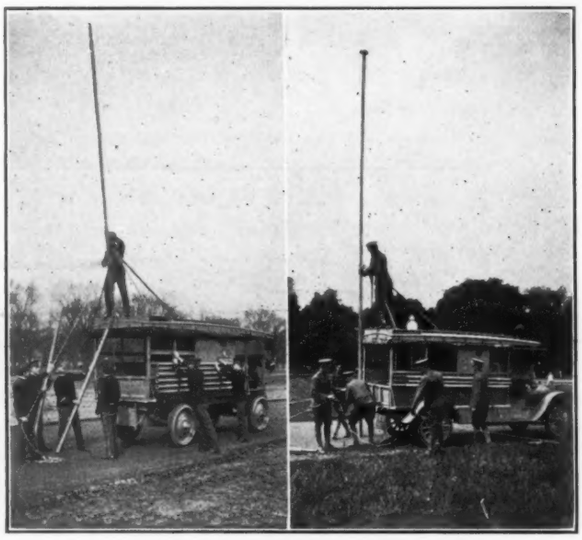
The International Typographical Union, which has been endeavoring since 1893 to have the United States government take over all telephone and telegraph lines, now plans, it is learned in Washington, to take additional steps in that direction at its convention in Los Angeles in August. A committee of the union, consisting of Mr. John B. Dickman, chairman, Mr. Samuel H. Bell, secretary, and Mr. William N. Brockwell, all of Washington, will bring in a report in favor of the governmental project. Incidentally, it is learned in Washington that Postmaster-General Burleson intends to renew his recommendations of previous years in favor of governmental control, and that the bill of Representative Lewis of Maryland providing for governmental control, which died in the last Congress, is to be reoffered at the next session.

Portable Radio Equipment of the United States Army

The Signal Corps of the United States Army has completed two types of portable radiotelegraphic apparatus, one employing a 1-kw. alternating-current generator of the high-frequency type and the other a 2-kw. generator. These outfits are now being used throughout the country in tests and practice.

A commercial type of ¾-ton truck chassis has been built to carry the portable wireless sets. By means of a special lever the electrical equipment can be thrown into gear with the automobile engine.

A portable switchboard is installed back of the driver's seat, on which is placed the apparatus for regulating and controlling the radio equipment. On top of the body are mast-hoisting shears which are folded down during transportation. An electric signal lamp is also carried on the wagon top. It has a powerful beam and may be used for signaling either directly or by wig-wagging.

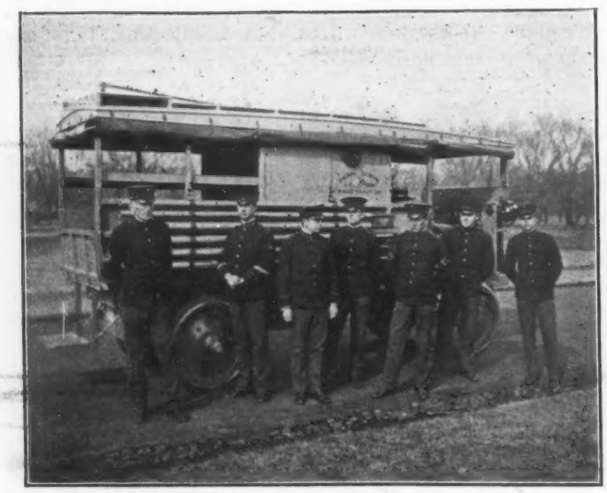


ERECTING AN 80-FT. MAST COMPLETE FOR RADIO OPERATION IN FIVE MINUTES

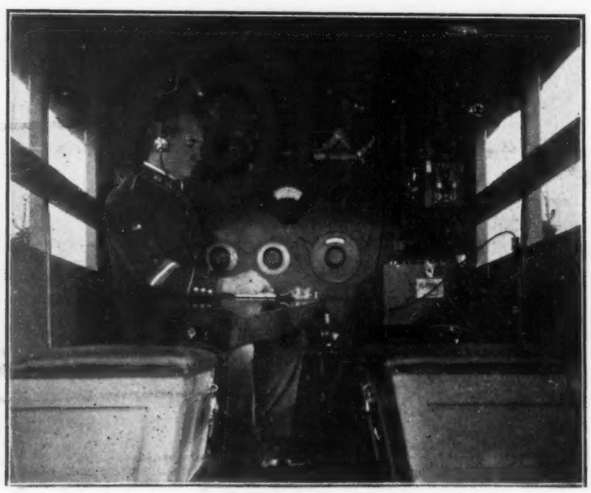
The weight of the complete radio set, loaded, is about 5000 lb., which is practically the same as that of a loaded escort wagon. It is light enough to follow the divisional headquarters under ordinary conditions, and for that reason is designed to take its place as the wheel radio equipment for the Signal Corps divisional organization.

One of our illustrations shows this radio tractor with complete crew, consisting of two chauffeurs, two radio operators, two messengers and one non-commissioned officer in charge. This crew is able to put up the 80-ft. mast supporting the umbrella-type antenna in about five minutes. This view shows the mast sections attached to the side of the car for transportation and the mast-hoisting shears folded down.

Under favorable conditions this set can communicate with a receiver at a distance of 150 miles, and it is believed that it can be depended upon, under ordinary conditions, for 100 miles.



U. S. ARMY RADIO TRACTOR AND ITS CREW



RECEIVING A WIRELESS MESSAGE IN THE FIELD

DIGEST OF ELECTRICAL LITERATURE

Generators, Motors and Transformers

Circle Diagram of the Induction Motor.—G. H. EARDLEY-WILMOT.—An illustrated article in which the practical construction and use of the circle diagram is given, as distinct from the more theoretical treatment often found in text-books.—London *Electrician*, July 2, 1915.

Flashing of Railway Motors.—R. E. HELLMUND.—An analysis of the causes of the flashing between brushes and from brushes to ground in railway motors. To prevent flashing it is necessary, first, to avoid the formation of an arc on the brushes, and second, to keep the voltage between the commutator segments so small that an arc cannot be maintained between them. The first means to avoid the formation of an arc on the brushes is to improve the commutation by means of interpoles, but while this helps greatly the author shows that interpoles cannot prevent flashing completely. It is, therefore, necessary to resort to the second means, namely, to design the motor so that there is not much voltage between the segments after they leave the brushes to maintain the arc when it has been established. It is evident that a large number of commutator bars between brushes, and a correspondingly small number of turns between segments, will not only reduce the rotational voltage between segments, but also the inductive voltage caused by changes in the main flux. It is, therefore, as a rule, possible practically to eliminate flashing by the use of a sufficiently large number of commutator bars. However, an increase in the number of commutator bars is not always productive of results. Excessive field distortion leading to a large maximum voltage between commutator segments can be avoided by making the main field comparatively strong, and designing the armature for a comparatively small number of conductors, so as to keep the armature field weak; it is further possible to avoid the large current rushes by giving the motor much self-induction. Other improvements may be obtained by properly designing other details of the motor. The whole subject is discussed with the aid of diagrams. Finally, two conditions of operation are mentioned under which almost any rational motor design is liable to flash. The first is that motors are at times subjected to very high overvoltages. The second is the practice of throwing the reverse handle of a four-motor equipment car while it is running at a fairly high speed, commonly known as bucking the motors. This practice should not be tolerated except possibly in order to avoid accidents.—*Elec. Journal*, July, 1915.

Lamps and Lighting

Photometry of Lights of Different Colors.—IRWIN G. PRIEST.—An abstract of an American Physical Society paper. The proposed method is shown in Fig. 1. L_s and L_x are respectively the standard and the unknown lamp. L_c is the comparison lamp. L_c and L_s should be of the same color. S_1 and S_2 are opal glass screens. *L-B* is a Lummer-Brodhun cube. *O* is the ocular focused on *L-B*, *N* is a fixed nicol prism, *Q* is a right-handed quartz plate cut perpendicular to the optic axis and placed with its optic axis coincident with the line of sight, *ZZ*. It is mounted so as to be readily removable from and replaceable in the path of the light. The best thickness of *Q* is to be determined by trial. *N'* is a nicol prism which can be rotated about the axis *ZZ*. *C* is a divided circle by means of which the rotation of *N'* can be measured. The procedure of making a measurement is as follows: *Q* is replaced by a colorless homogeneous and isotropic glass plate of about the same refractive index. *N'* is set at 90 deg. from its previously determined position for total extinction. L_s and L_c are balanced by sliding L_s along *XX*. L_c having been set at a convenient standard position, L_s is replaced by L_x and *Q* is replaced in the path *ZZ*. By sliding L_c and at the

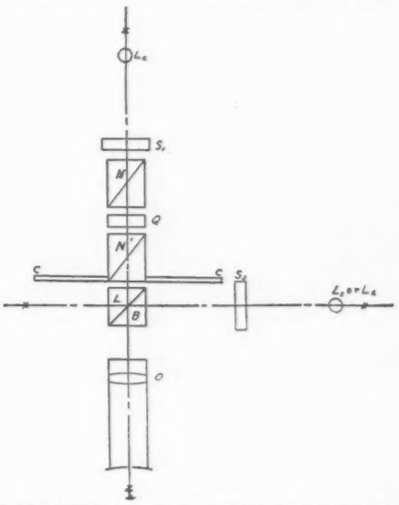


FIG. 1—PHOTOMETRIC METHOD WITH LAMPS OF DIFFERENT COLORS

same time turning *N'*, a complete match of both color and brightness is obtained. A method of computing the candle-power of L_x is suggested.—*Phys. Review*, July, 1915.

Tungsten Filaments.—A note on a recent British patent (No. 13,076, 1914) of the British Thomson-Houston Company and the General Electric Company of this country for a method of rendering drawn tungsten wire capable of taking a permanent set without heating, which consists in heating the wire after drawing in an oxidizing atmosphere, and then heating the oxidized wire in an evacuated chamber or in nitrogen or hydrogen with or without water vapor.—London *Elec. Eng'ing*, July 1, 1915.

Traction

Electric Vehicle.—An editorial on the present status of the electric vehicle. The user's point of view is first considered and some figures of cost are given from Ayton's recent report to the (British) Municipal Electrical Association. An electric vehicle of the type of a light delivery van, or its equivalent, requires about 0.5 kw.-hr. per mile, including battery losses; thus, with energy at 2 cents per kw.-hr., this amounts to about 1 cent per mile. The firm of Liberty has obtained the figure of 0.8 cent, as against 3 cents per mile for petrol. A. C. Cramb gives as the result of his experience in Croydon a total of 11.57 cents per mile, including depreciation and other charges, and assuming a mileage of 5000 miles per year. As to the viewpoint of the electrical engineer, it is pointed out that he needs to be converted even more than the layman in view of the difficulty to obtain a reasonable tariff for the charging of electric cars from some British stations. "Some stations have gone so far as to demand a minimum of $1.25 per charge, which is just the way to stop progress."—London *Electrician*, June 25, 1915.

Installations, Systems and Appliances

"Point Five Tariff."—A. S. BLACKMAN AND THOMAS ROLES.—Their report to the (British) Municipal Electrical Association on practical results obtained with the

"point five tariff." The essential of the energy rate system is that the secondary charge is 0.5d. (1 cent per kilowatt-hour); the primary charge has been based on either the kilowatts connected or upon taxable value, but might be made to depend upon any other suitable basis. The two authors have had experience only with the taxable value system. In the application of a "point five tariff," based upon ratable values, discretion should be exercised in favor of the consumer who, in consequence of it, is taxed out of proportion to the size of the house. A marked advantage of the taxable value basis is the facility with which an accurate estimate of a consumer's bill can be prepared. Once the fixed charge for a house has been ascertained, a wide error may be made in assuming the number of kilowatt-hours that will be used, and the estimate will still remain reasonably correct. This facility for estimating has been found in practice to be a very useful asset to the canvassers in towns where a cheap supply of gas has to be competed against. It likewise follows that the importance of any error in metering is correspondingly lessened. A number of statistical data are given on the working of the rate schedule in Bradford, where, on Dec. 31 last, 1298 private-house consumers were connected to the supply, whereas prior to the introduction of this method of charging on July 1, 1910, the number of such consumers was only 511, representing the result of nearly twenty-one years' working. Thus during the four and one-half years the "point five tariff" has been in force the number of domestic consumers has increased by 787, or over 150 per cent; 403, or more than half, of these consumers have elected to be charged on the special rate, the houses being in practically all cases electrically lighted throughout. Three hundred and eighty-three of the 511 private-house consumers on the supply at June 30, 1910, have adopted the "point five tariff" in place of the lighting flat rate of 8 cents per kilowatt-hour under which they were previously charged. Further figures are given on the increase of the load-factor, diversity-factor, etc. Similar data are given on the results obtained in Sunderland. At the introduction of the "point five tariff" there 337 private houses were connected to the supply, the majority partially lighted only as the result of sixteen years' working. Since the rate schedule was introduced upon Jan. 1, 1912, three years' working has resulted in 162 more private houses being connected; 100 of these elected to be put on the "point five tariff" and are lighted throughout, and sixty-two upon a flat rate of 7.2 cents per kilowatt-hour. Of the 337 houses that were on the supply at Jan. 1, 1912, 105 have changed over from a flat rate at 7.2 cents per kilowatt-hour to the "point five tariff." The average consumer's load-factor on kilowatts installed has been increased from 2.44 per cent to 4.05 per cent, an increase of 66 per cent. Figures on the diversity-factor are added. A full account of the discussion which followed is also given in the same issue.—London *Electrician*, June 18, 1915.

Protecting Machinery Against Abnormal Electrical Conditions.—C. C. GARRARD.—The first part of an article in which the author deals first with the conditions which give rise to abnormal electrical conditions of a transient type, such as those due to switching, arcs and sparks. Methods of suppressing arcs to earth are to be described. The author is then to pass on to pressure rises between the turns of electrical windings and those due to causes exterior to the system, such as lightning. Various protective devices are to be described, such as water-jet earthing resistances, the Moscicki and other condensers, Giles' valve and the more ordinary lightning arresters. In conclusion the question of earth places is to be considered.—London *Electrician*, June 11, 1915.

Wires, Wiring and Conduits

Joint-Box Compound.—A note on a recent British patent (No. 17,686, 1914) of W. H. Walker for a compound for cable joint-boxes for exposed situations, which remains plastic indefinitely and protects machined iron surfaces. It is composed of prepared chalk from 60 to 80 per cent, vaseline from 10 to 20 per cent, ol risini from 1 to 5 per cent, and oxide of iron paint from 1 to 5 per cent.—London *Elec. Eng'ing*, June 24, 1915.

Protection from Lightning and High-Voltage Disturbances.—Q. A. BRACKETT.—An article on the protection of electrical apparatus from lightning and other abnormally high-tension disturbances. The author first describes the different kinds of disturbances and their effects, and then deals with the protection of the line and of the station, describing the following types of lightning arresters: horn-gap arrester, the non-arcing metal arrester, and more in detail the electrolytic arrester.—*Elec. Journal*, July, 1915.

Electrophysics and Magnetism

Laws of Induction.—DAVID ROBERTSON.—With reference to the recent paper of Blondel it is said that to define the emf. exactly it is necessary to seize on the fundamental fact that is common to all kinds of emfs., and that one is the interchange of energy when electricity flows. "If electricity would give out or receive energy on passing through a certain place, then there exists at that place an emf. which is measured by the energy received by each unit of electricity." The emf. "assists" the flow where the current receives energy, and "opposes" it where the current gives out energy. The definition makes the former positive and the latter negative. The writer applies this definition to the problem discussed by Blondel. There can only be an induced emf. if the circumstances are such that a flow of electricity involves the receiving or giving out of energy through the agency of the magnetic field. There are but two possible sources of that energy: that already stored in the magnetic field (inductance emf.) and the mechanical work done by an agent causing relative movement of the flux and circuit (motion emf.). The mechanism by which the energy exchange takes place is probably identical in the two cases, for we associate a change of the field with a movement outward or inward of the flux. The energy stored in the magnetic field cannot be altered by any change whatever in a coil which does not itself exert an appreciable excitation, and is made of a material whose magnetic properties are the same as those of the medium in which it is immersed. If, then, the change be of such a nature that it only involves movements along the flux, and thus perpendicular to all possible electromagnetic forces, there can be no possibility of drawing on either the stored energy or mechanical energy, and consequently there can be no induced emf.—London *Electrician*, June 18, 1915.

Negative Thermionic Currents from Tungsten.—K. K. SMITH.—An account of an experimental investigation the object of which was to determine quantitatively the negative thermionic emission from tungsten over a large temperature range, and to discover, if possible, more evidence as to the conditions which determine the emission. One of the most interesting results of these experiments is the enormous range of validity established for the emission formula $i = aT^{\frac{1}{2}}e^{-b/T}$, when the conditions are such that no change in the character of the emitting surface is believed to occur. i is the saturation (maximum) current in amperes per square centimeter and T is the absolute temperature. The quantities a and b are constants, the latter being proportional to the work done by an electron in escaping from the metallic surface. The formula is shown to hold

while the current is varied by a factor of 10^{12}, the corresponding range of temperature being from 1050 deg. K. to 2300 deg. K. An equally good agreement is, however, shown with the formula $i = CT^{n}e^{-d/T}$, with C and d constants and d equal to 52,000, so that it is not possible to distinguish between the relative merits of these two formulas with the data so far obtained.—*Philos. Mag.*, June, 1915.

Electrochemistry and Batteries

Addition Agents in Electroplating.—A. MUTSCHELLER.—In a second article on this subject, the author discusses the relative migration velocities of the ions in complex electrolytes. The principal conclusion of the author's experiments is that addition of colloids to electroplating solutions changes the migration velocities of the ions, and in all cases in which the addition agent is found to have a beneficial effect on the deposit the migration velocities are so changed that the concentration of the cations is maintained automatically constant at the cathode.—*Met. and Chem. Eng'ing*, July, 1915.

Measurement of the Conductivity of Electrolytes.—W. A. TAYLOR AND H. L. CURTIS.—A long abstract of an American Physical Society paper on an accurate method for the measurement of the conductivity of electrolytes. The experimental investigation related especially to three phases of the problem: first, the obtaining of a source of alternating current which is practically free from harmonics and whose frequency can be varied through wide limits; second, the construction of a suitable bridge; and third, the designing of satisfactory cells and the study of the effect of changes in voltage and frequency on the resistance of electrolytes. For the solution of the first problem a Vreeland oscillator was finally adopted because it gives not only a pure sine wave but also an exceedingly steady frequency, which can be changed at will by means of suitable condensers. An electrolytic cell behaves toward an alternating current as though it were made up of a capacity in series with resistance. Hence when used in an alternating-current bridge it is necessary to compensate for the capacity either with inductance or capacity. The most satisfactory method is to use a variable inductance in series with the cell. To eliminate as many corrections as possible, a substitution method is employed as shown in Fig. 2. R_1 and R_2 are ratio coils of 100 ohms each,

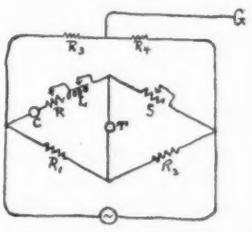


FIG. 2—METHOD USED IN MEASURING CONDUCTIVITY OF ELECTROLYTES

S is the resistance in the bridge, R a substitution resistance, C the cell, T the telephone, and L a variable inductance. The resistance box R is set on zero, and with the cell in circuit S and L are varied until there is no sound in the telephone. Then the cell is short-circuited and the bridge again balanced by varying L and R. The reading of R is then the resistance of the cell. By working in this way the authors have found that, under favorable temperature conditions, measurements upon a cell will repeat to one or two parts in a hundred thousand. It was found that there is no measurable change in resistance with change in voltage, provided the cells, solutions, and the bottles used to hold the solutions, are kept scrupulously clean. The slightest trace of grease or dirt, however, causes a change in resistance with change in voltage. With bright platinum electrodes there is a change in apparent resistance with change in frequency, and this difference depends on the size of the electrodes, the largest electrode giving the smallest change in resistance. With platinized electrodes the change in resistance was found to be zero or small. In the platinized electrodes the surface is very much increased so that the change in resistance with change in frequency seems to depend directly on the size of the electrodes. The author concludes that the 1-in. platinized electrodes give the true resistance of the solution, and that we may be able to correct for the change in resistance with change in frequency with bright platinum electrodes, so that they can be used as well as platinized electrodes for making measurements of the conductivity of electrolytes, although perhaps with less accuracy.—*Phys. Review*, July, 1915.

Units, Measurements and Instruments

British National Physical Laboratory.—An abstract of the annual report of the British National Physical Laboratory. In the electrical standards division F. E. Smith again calls attention to the great accuracy with which the fundamental electrical standards can be reproduced. A comparison between five mercury resistance tubes made and calibrated at the National Physical Laboratory and five constructed at Tokio shows a mean difference of eight parts in 1,000,000, while Weston cells made at Petrograd were found to agree with the laboratory standards to within one part in 100,000. During the year there was a reduction of more than $20,000 in the income of the laboratory, but the final financial results are considered to be quite satisfactory. An account is given of the work contemplated for the next year. It is proposed to carry out experiments with the new Schuster magnetometer; in addition to using the instrument to measure the horizontal component of the earth's magnetic field, it is proposed to measure the vertical component and thus indirectly the inclination. Direct measurements of the magnetic inclination may also be made with a new form of inductor. Many details of the method for a redetermination of the mechanical equivalent of heat have been worked out, and it is hoped it will be possible to proceed with the construction of the apparatus and to make preliminary experiments. The determination involves the construction of some special platinum thermometers and a new bridge. The development of suitable sub-standards for use in the testing of gas-filled electric lamps is becoming an urgent matter. Experimental standards already made up for the laboratory by the Osram Lamp Works are being thoroughly tested before duplication into complete sets of standards. The cascade method adopted at the laboratory for the realization of candle-power in white light will be eminently suited for extension to these sources of light of still higher efficiency. Four sets of gas-filled standards are required to bridge the color interval between the present highest temperature standards operating at 1.5 watts per candle and those required in the testing of nitrogen-filled lamps, and their preparation and standardization will be pushed forward during the year. The experiments on the coefficient of reflection of the white cards used in photometry will be continued and extended to some other materials, a knowledge of whose characteristics in this respect will be of practical value. Photometric measurements in favorable circumstances can be carried out to an accuracy of about one part in 1000. On account of the rapid change of candle-power of electric lamps with voltage, this change of one part in 1000 will be caused

by a change of one part in 5000 in the voltage, and the ratio is still greater if adjustments are made on the basis of current. It is, therefore, necessary that instrumental errors in the electrical measurements should not exceed about one part in 10,000. This is an accuracy higher than is required in general commercial measurements, and it is difficult to attain with commercial apparatus. The requirements of precision photometry have led to the consideration of the design of a special potentiometer for such measurements, and drawings have been got out for one of comparatively low resistance, without a slide-wire, which will measure up to 3 volts by ten-thousandths of a volt. It is hoped that it will be found possible to "put it in hand" during the year. If opportunity permits, it is hoped to repeat to a greater accuracy, and to extend the scope of the experiments on the method of color identity for the estimation of the temperature of glowing bodies. Measurements are being made at the instigation of the British national committee on illumination to determine the correct flame height of the hefner lamp to give one British candle. This account is to be continued.—London *Electrician*, June 25, 1915.

Telegraphy, Telephony and Signals

Cause of Ionization of the Atmosphere.—J. A. Fleming.—In connection with the propagation of electric waves, the author considers the production of a permanently ionized layer in the earth's atmosphere by light-propelled ions from the sun.—London *Electrician*, June 11, 1915.

Book Reviews

Official Report of the Second National Foreign Trade Convention. Held at Planters' Hotel, St. Louis, Mo., Jan. 21 and 22, 1915. Issued by the Secretary National Foreign Trade Council, 64 Stone Street, New York. 284 pages. Price, $1.50.

In the foreword attention is called to the remarkable timeliness of the First National Foreign Trade Council, held at Washington on May 27 and 28, 1914. The broadening scope of the work of the council is indicated by the report of the second convention.

Electricity for the Farm. By Frederick Irving Anderson. New York: The Macmillan Company. 266 pages, illus. Price, $1.25.

The author wanted to give the farmer a practical working knowledge of the uses of electrical energy for light, heat and motor service on the farm. He therefore describes some necessary apparatus and appliances. The book is devoted generally to accounts of simple means whereby the farmer may generate his own energy, particularly if he has available water-power. While its usefulness in this direction is marked, the central-station reader is likely to reflect on the opportunities afforded by the central-station service now available over great areas of the country.

The Law of Electricity. By Arthur F. Curtis. Albany, N. Y.: Matthew Bender & Company. 1034 pages. Price, $7.50.

The author recognizes that the law of electricity is too modern to have acquired an established scope. Members of the National Electric Light Association will recollect in this connection the statement in the last report of the public policy committee that, so far as the information of that committee went, no rate case affecting electrical properties has been decided by any high court in any State. The comprehensiveness and value of the present volume are shown by its careful treatment of such matters as franchises, contracts for electrical service, taxation, right-of-way for lines, abutting owners, conduits, electrolysis, inquiries of persons and properties, insulation, etc.

Repertorium der Physik. By Rudolf H. Weber and Richard Gans. Leipzig, Germany: B. G. Teubner. 434 pages, 126 illus. Price, 8 marks.

This volume, dealing with mechanics and acoustics, is the first of a series on physics intended for the use of physicists and advanced students in that subject. The treatment is mathematical but is prepared from the viewpoint of the physicist rather than from that of the mathematician. The main chapters of the book relate to the following subjects: Mechanics of a particle, mechanical principles, dynamics of rigid bodies, gravitation, systems of co-ordinates, theory of oscillations, mechanics of a continuous medium, hydrodynamics, fluid vibrations, acoustics. The book is scholarly, carefully edited and clearly written. The sections on elasticity are particularly attractive. The volume will commend itself to physical investigators and to students of advanced natural philosophy.

Public Utilities; Their Fair Present Value and Return. By Hammond V. Hayes. New York: D. Van Nostrand Company. 208 pages. Price, $2.

In this volume the author discusses the line of reasoning which must be followed by those who have the duty of ascertaining the fair present value of a property after an appraisal and when all necessary information has been obtained. He also considers giving value and depreciation with the hope of "removing some of the present misunderstanding." In a controversial subject differences of opinion are inevitable, but if fair bases of valuation are to be established, the questions at issue must be studied from every angle; and Mr. Hayes' work is a contribution in this large field of research that should have attention. The author raises an interesting point when he says that even with public utility monopolies some degree of competition exists because of the comparison of rates in one community with those in another.

Electrical Instruments in Theory and Practice. By W. H. F. Murdoch and U. A. Oschwald. New York: The Macmillan Company. 366 pages, 164 illus. Price, $2.75.

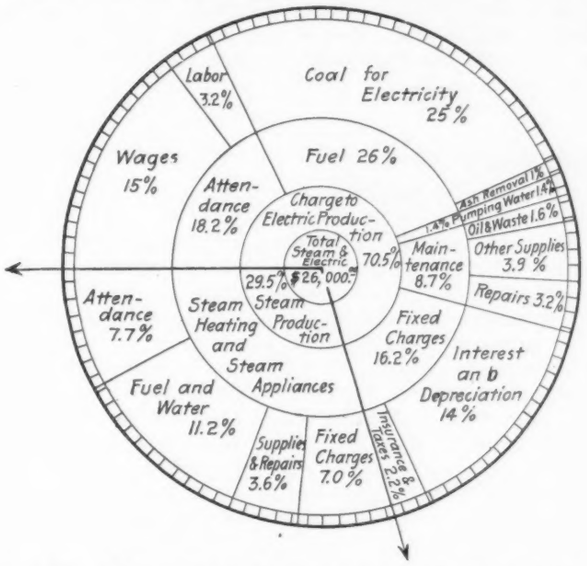
An excellent little specialist's textbook on the working mathematical theory of electrical instruments from the engineering standpoint. Whereas the ordinary textbook on such subjects gives only a very meager mathematical outline of the theory, or else an elaborate and highly theoretical treatment from the physicist's point of view, the author of this book elaborates the theory in a very practical way to a stage that more nearly meets advanced engineering requirements. The work is divided into ten chapters relating to the following topics: Historical summary; electromagnetic damping; permanent-magnet moving-coil instruments; iron-cored instruments; electrostatic instruments; hot-wire instruments; dynamometer instruments; supply meters; magnetic testing instruments, and potentiometers. The chapter on damping is particularly good. The book meets the particular need above outlined remarkably well, and will be appreciated by electrotechnically trained students interested in the design and mode of operation of electrical engineering instruments from the mathematical standpoint.

POWER AND OPERATING SECTION

Graphic Analysis of Steam-Electric Power Costs

BY J. WILMORE

The importance of keeping accurate records of power-plant operating conditions and costs is now generally recognized. However, the systems that have been worked out apply in most cases to conditions in large stations. From the standpoint of efficiency and econ-



DIVISION OF OPERATING COSTS IN A SMALL STEAM PLANT

omy, records of operating data and costs are as essential in small plants as in large plants, and in order to devise proper records, the operating conditions and service requirements of the plant must have careful study. Unless this is the case, the records, though extensive and even elaborate, are often of little value.

The writer has found that the usual figures and diagrams submitted to busy executives have very little meaning unless considerable study is devoted to them in calculating and interpreting the data. Usually, tables of figures giving total dollars, or perhaps a tabulation of percentages, are the forms most common. However, such figures do not give at a glance the actual proportion that any one item may bear to the other, for the reason that it is not an easy matter to conceive of relative values.

A graphical presentation of data and costs which represents proportions is, on the other hand, readily understood by almost anyone at first sight. With this fact as a basis, the writer has devised a means of presenting operating costs as in the diagram shown above. Such a diagram gives the actual annual division of charges as found in a small steam-electric plant. The diagram is so divided that all accounts chargeable to steam production are kept independent of those chargeable to the production of electric energy, which is a vital point in analyzing costs in any plant where both steam and electrical energy are used for separate and individual purposes.

The plant of the type to which the diagram refers and from which the data shown in the latter were secured is installed in the basement of a light manufacturing building. Inasmuch as the power costs are the only items affecting the operation of the plant, all charges for the steam and electric distribution systems are omitted, as these are chargeable to the building account.

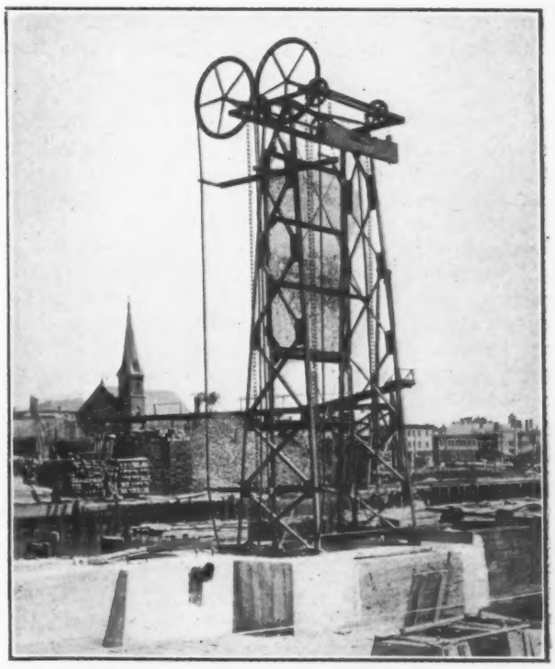
The plant equipment consists of two direct-current generating units, one of 75-kw. and the other of 200-kw. rating. These generators are directly connected to non-condensing steam engines, and with three coal-burning steam boilers of an aggregate rating of 600 hp., the necessary auxiliaries with piping and wiring complete, represent an investment of about $40,000.

Coal costs $3 per ton at the plant, and water is obtained by pumping it. Exhaust steam is utilized for heating purposes and hot water. The maximum demand is 230 kw., and the average monthly production of electrical energy is 62,700 kw.-hr., representing a load factor of 65 per cent as related to the maximum output of the generator units under steam. The plant employs seven operators the year around, who compose the engineering and operating staff. Under such conditions the electrical energy is generated for about 2.43 cents per kw.-hr.

The chart shown appeals to the writer as a simple presentation of data and a clear analysis of steam-power-plant costs arranged in such a way as to make comparisons and deductions possible at a glance.

Arrangement for Handling Intake Screens

At the steam-generating station of the Salem (Mass.) Electric Lighting Company double intake screens are provided at the point where the salt water used for condensing supply is led into a concrete conduit. As

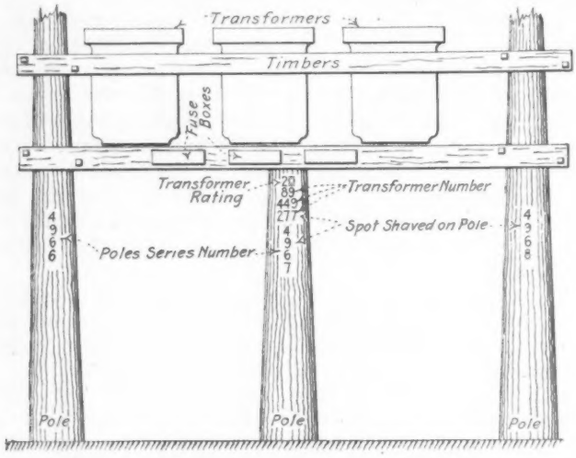


COUNTERBALANCED SCREENS ARRANGED FOR RAISING AND LOWERING BY ONE MAN

shown in the accompanying illustration, a special arrangement has been provided to handle these screens. Each screen is counterbalanced at the end of two chains carried over sprocket wheels at the top of the tower shown. On an extension of each sprocket shaft a pulley operated by an endless rope is mounted so that one man can easily raise or lower the screens. When lifted out of the intake chamber they are swung out of line with their vertical travel and rest on a concrete shelf. The structural-steel supporting tower which carries the screens and the operating gear is about 20 ft. high.

Number System Keeps Track of Transformers

A numbering scheme for transformer installations has been adopted by the Springfield (Mo.) Gas & Electric Company which, in addition to being simple and convenient in operation, helps the operating department to keep a complete and accurate record of each



NUMBERS AND RATINGS OF TRANSFORMERS SHOWN ON SUPPORTING STRUCTURE

transformer. When a transformer installation is finished, as is the one shown in the accompanying illustration, three sets of figures are stenciled in conspicuous places on the poles. The top figure, which in this instance is "20," indicates the kilowatt rating of the transformers. Beneath this number follow three other figures, which are the permanent designation numbers of each of the transformers composing the installation. Beneath these transformer numbers and separated from them are placed the serial numbers of the poles which carry the transformer bank.

Using this system it is possible for any of the company's employees to obtain information on any transformer or group of transformers from the books of the operating department, for the operating department keeps its record of all transformers and transformer banks arranged according to the original number of the transformer unit.

The Proper Location for a Reducing Valve

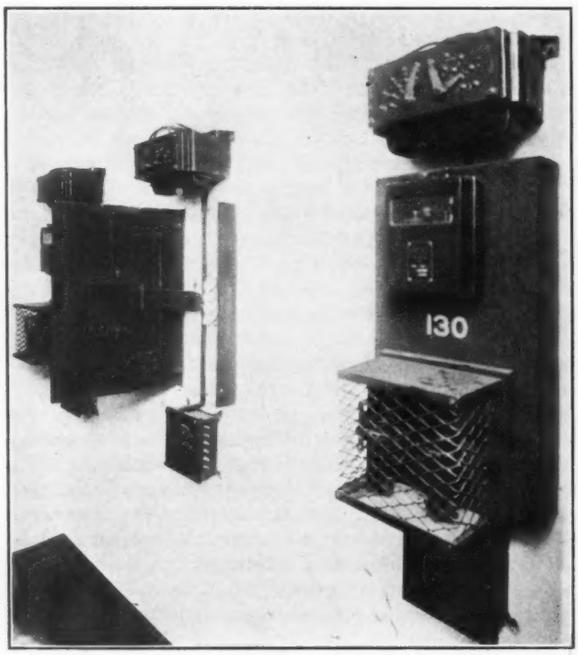
When steam is reduced from boiler to service pressure the reducing valve should be installed just before the first service connection. The advantage of this location is in the carrying of steam at a higher pressure and a relatively smaller volume. A smaller size of steam main can then be used, thereby reducing the first cost of piping, valves, fittings and covering, labor and maintenance, as well as the amount of surface from which heat may be lost by radiation.

Under some conditions, however, it may be advisable to locate the reducing valve in the boiler room. The first service connection may be near by and the run short; it may be necessary that the valve be readily accessible for control by the engineer, or future connections from the main at points nearer the boiler house may be planned. If the last condition is the governing one, however, it will usually be advisable properly to place the valve and then move it later as desired.

A reducing valve is sometimes located in the boiler room and supplies a main of insufficient size. The remedy for this condition lies in the relocation of the valve as advised. The drop in pressure in an undersized main due to the friction and size of main will vary according to the demand for steam, thereby producing a varying or insufficient pressure at the service outlets with additional difficulties due to excessive moisture in the steam. With the reducing valve near the service outlets difficulties of this nature are eliminated, as the valve will reduce to the pressure for which it is set, and maintain that pressure constantly.

Regulator Control Apparatus Mounted to Protect

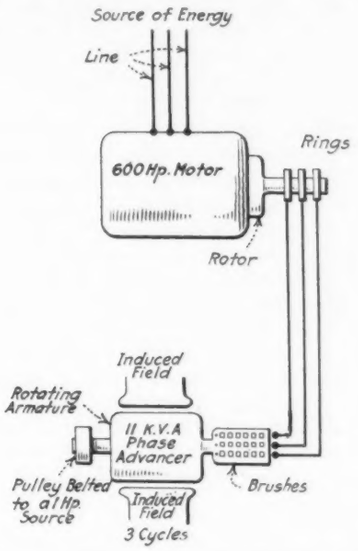
Shown in the accompanying illustration is a compact method of mounting voltage-regulator control equipment so that no wiring or energized conductors are exposed. Plug cut-outs are provided in the primary and secondary relay circuits so that these may be de-energized in case the relays or motor operating the regulator need repairing or adjusting. Each set of control equipment is mounted on a slate panel opposite its respective regulator. The panel is supported a few inches from the wall, through which the control wires emerge by angle irons forming a rear compartment in which flexible connections and plug receptacles can be installed. Hinges are attached to the right-hand edge of the panel and the corresponding angle iron, so that the rear compartment can be opened and plugs removed before touching any of the regulator control or operating mechanism. This method of mounting regulator control apparatus is employed by the United Electric Light & Power Company, New York City.



CABINETS FOR REGULATOR CONTROL WIRING SHOWN OPEN AND CLOSED

Action of Phase Advancer in Regulating Power-Factor of an Induction Motor

In a discussion at the annual convention of the Brooklyn Section of the National Electric Light Association on that part of the 1915 report of the N. E. L. A. committee on electrical apparatus taking up the use of phase



NATURE AND CIRCUITS OF PHASE ADVANCER USED WITH AN INDUCTION MOTOR

advancers as an economical means for regulating the power-factor of individual motors, Mr. G. L. Knight, designing engineer of the Edison Electric Illuminating Company of Brooklyn, gave the following interesting explanation of how the phase advancer operates, what its advantages are, and how it differs from the synchronous condenser:

The phase advancer bears the same relation to an induction motor as a direct-current exciter bears to the synchronous condenser, for the phase advancer supplies current at slip frequency to the field of the induction motor. The machine mentioned in the N. E. L. A. report is a 600-hp., sixty-cycle wound-rotor, slip-ring induction motor of 5 per cent slip, with an 11-kva. phase advancer driven by a 1-hp. induction motor, as shown in the accompanying illustration. In this case the operating conditions are as follows:

(1) The source of energy supplied the 600-hp. motor is sixty cycles.

(2) The speed of the 600-hp. motor under load, therefore, corresponds to fifty-seven cycles.

(3) The frequency of the current in the rotor of the 600-hp. motor is three cycles.

(4) The frequency of the current supplied the collector rings of the 600-hp. motor from the brushes of the 11-kva. phase advancer, these brushes securing their current from the rotating armature of the phase advancer, is three cycles.

(5) The frequency of the flux in the field of the 11-kva. phase advancer is three cycles.

In the case of the synchronous motor these values would be as follows:

(1) Source of energy, sixty cycles.

(2) Speed of the motor, corresponding to sixty cycles.

(3) Frequency of the current in the rotor, zero cycles (direct current).

(4) Frequency of the current at the collector rings of the motor, zero cycles (direct current).

(5) Frequency of the flux in the field of the exciter, zero cycles (direct current).

Just as a synchronous motor may be operated without receiving direct-current excitation into its revolving field, an induction motor may be operated without receiving three-cycle excitation from an outside source into its rotor. In both cases the motors draw magnetizing current at sixty cycles from the line at lagging power-factor. This magnetizing current which goes into the stator reaches the rotor by induction or transformer action.

The synchronous motor, however, may have excitation from an external source gradually applied to its rotor, thereby raising the power-factor of the current drawn from the line approximately to unity. The same holds true for a slip-ring induction motor, except that the excitation must be alternating current and must be at slip frequency, in this case three cycles.

The excitation of a synchronous motor may be increased still further and the power-factor raised from unity to leading. The same thing holds true of an induction motor with a phase advancer.

The field flux of the phase advancer can be maintained at precisely the required frequency of three cycles, on account of the fact that the phase advancer has no definite poles and runs at no definite synchronous speed. The point is that the field of the phase advancer is an induced field, the current which induces it is at slip frequency or at three cycles, and, therefore, the field flux must also be at three cycles.

The advantage of the phase advancer is that it can be applied directly to existing slip-ring induction motors now in service and overcome the disadvantages which their low power-factor produces.

A Special Anchor and Guy

Sixteen copper feeders, ranging in size from No. 0000 to 300,000 circ. mils., and terminating at a single stub pole, obviously set up strains which require special anchoring and guying. Each feeder of the Chicago lead illustrated herewith terminates in mid-span and is connected through strain insulators to a steel messenger wire of 0.375-in. or 0.5-in. diameter, according

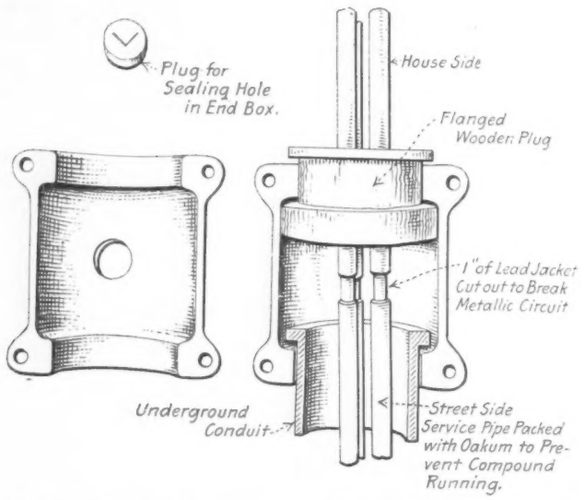
A TUBULAR STEEL POLE GUYED TO SUPPORT SIXTEEN FEEDERS

to the corresponding feeder size. These messenger wires or longitudinal guys are then attached to pole bands encircling the top of the tubular steel pole and providing clevises at the front and rear of the stub for the anchor rod and guys. The 2.25-in. anchor rod, instead of being joined to the top of the pole by steel wires, is continuous and reaches from the "deadman"

to the pole top. Near the center of the rod a huge turnbuckle has been interposed, and at the point where the rod enters the earth the rod is incased in an iron pipe and the void between the inner wall of the pipe and the exterior of the rod is filled with concrete. The "deadman" consists of a steel I-beam and a number of 12-in. by 12-in. timbers, and is buried in a hole measuring 6 ft. square at the ground line and about 7 ft. in depth. Concrete was spread over this material to a depth of several feet, and the hole was then filled in with dirt, establishing a solid footing against which even such a heavy lead can pull in all kinds of weather, without the anchorage "giving" to the strain.

Method of Sealing Service Ends of Conduits

When it is necessary to seal the service ends of underground conduits and at the same time insulate the cable sheath from the ground, an end box like the one shown herewith can be used. It consists of a split metallic cylinder bolted together and fastened to the end of the


Plug for Sealing Hole in End Box.
House Side
Flanged Wooden Plug
1" of Lead Jacket Cut out to Break Metallic Circuit
Underground Conduit
Street Side Service Pipe Packed with Oakum to Prevent Compound Running.

A SEAL FOR SERVICE ENDS OF UNDERGROUND CONDUITS

underground conduit. Before it is attached, however, "okum" should be packed between the emerging cables and the conduit. Then a 1-in. strip of the sheathing should be peeled off from each cable just outside the conduit outlet to insulate the covering from that extending underground. A flanged wooden plug containing holes of the same diameter as the cables can then be slipped over the cables and fitted into the end box as shown. After this is done, the parts of the end box can be bolted together and the box filled with insulating compound through a hole on one side. The use of such a box installed on the house end of a service conduit prevents moisture, gas and stray currents entering the conduit. This scheme was suggested in the recent report of the committee on underground construction of the National Electric Light Association.

Laying Dust on Concrete Floors of Stations

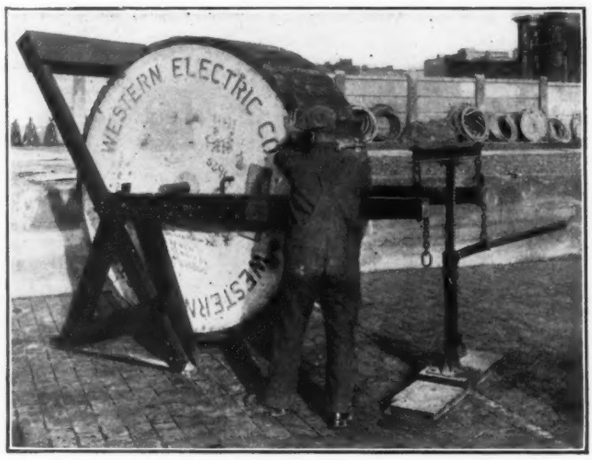
In those steam power plants and hydroelectric stations that have concrete floors the elimination of dust due to wear is often an important problem since it gets into the bearings of station equipment and is of such a nature as to cause trouble. In a discussion on this subject at a recent meeting of the American Concrete Institute, it was pointed out that more than thirty different methods have been adopted to eliminate the dust from concrete floors but that only two or three have been found satisfactory. Silicate of soda was included among the remedies that have given fair results.

A better remedy, however, is a coating of linseed oil. In one case raw oil was used and the excess wiped off with waste, but later developments have demonstrated that boiled oil was better than raw oil, since it dried more quickly. One objection to the oil was that it produced a mottled appearance due to unequal absorption, but this undesirable feature has been overcome by the inclusion of lampblack, which gave the floors so treated a uniform slate color.

It was generally agreed that dust from concrete floors was the result of using a mixture too rich in cement or sand of too fine grain. Both of these causes are readily obviated by the use of a coarser and harder sand, or even crushed granite screenings in the wearing surface, and by a reduction in the quantity of cement. The more recent introduction, however, of fine iron and steel filings into the cement used in the wearing surfaces of concrete floors is meant to attain the same end, and logically there is no reason why it should not. Another precaution employed to improve the wearing quality of concrete floors is to use only enough water to make the surface trowel without undue effort. It should also be allowed to cure for at least ten days, during which time it should be sprinkled frequently to complete the hydration of the cement.

A Rack for Cable Reels

A convenient rack for a cable reel and a means for mounting the reel on it are shown in the accompanying illustration. When it is desired to rotate the reel on its axis the rack is placed around it as shown. Two skids are then hung on the bolts projecting from the side of the A-shaped supports, a steel rod is inserted in the reel to serve as an axle, and a lifting jack attached to the outer ends of the skids in the position shown. As the skids are raised by the jack the reel rolls into place on the supports. The stops attached to the top of the rack supports in front of each end of the axle hold



AN ARRANGEMENT FOR MOUNTING A CABLE REEL ON A RACK

the reel in its proper position as well as prevent it from rolling off. When the reel is in position the skids can be removed.

The base of the rack is only about 2 ft. wider than the reel, so very little space is occupied. The New York Telephone Company employs a number of these cable racks.

COMMERCIAL SECTION

Enthusiasm

THE salesman who cannot feel and express enthusiasm for his company has something wrong with him. He is asking men and women to believe in a thing for which he himself shows a blighting indifference, and he is more of a menace than a material aid. He may continue to take orders but he never can exert the power of a creative salesmanship. If he can find no joy and honest pride in serving his employer, it is better far that he should seek some other work to do.

Action in Fan Displays

THERE may be some excuse for displaying electric irons motionless in show windows, but the window dresser who exhibits electric fans and does not set them turning merrily deserves to lose his job. He merits a more gentle reprimand if he does not tie a few dainty bright-colored streamers to the fan frames so that they will swirl gracefully in the artificial breeze. Fans typify action. They are useful only when in motion. Show this action, therefore, to prospective customers. The extra effort and expense required is very slight.

Should the Salesman Collect?

THE question whether the salesman should be utilized in emergencies to collect difficult accounts has never been settled to anybody's satisfaction or conviction. From time to time we hear that some new central station has adopted the policy, but the argument against it continues ever strong and more light is needed on the issue. It sounds like a routine matter of system, perhaps, but after all we question whether there is another administrative influence of greater hazard to the selling effort. It is more important that a customer be not estranged than that a new "prospect" be won to sympathy, yet many central-station commercial managers are loud in their condemnation of the plan, on the ground that it harasses the salesmen and involves them with their customers. Others have taken advantage of the friendly personal relationship which exists between the salesman and his customer to make the former final intermediary in all such cases. Which is right? Is it dangerous to entangle the salesman in collection troubles? Or is the salesman's influence too valuable to be sacrificed in the crisis? The answer can be found only in the experience and opinion of the managers who have experimented with the plan, and to that end the ELECTRICAL WORLD recently obtained the views of many of the most progressive and successful central-station commercial men throughout the country, which will be presented in the Commercial Section in an early issue. The editors will welcome further word from any of our readers who can contribute the account of any experience in this all-important work of keeping the customer both pleased and profitable.

Better than Attendance

IN counting the results of a recent function in one of the successful electric shops, it developed that whereas the attendance had numbered considerably less than on the occasion of a similar electric show the preceding year, both sales and profits were greater. It emphasizes the fact that a record crowd does not always mean a record profit, as every merchant knows, a point that should be well considered in the planning of any popular event in the electric store. Surely the crowd must come if the volume of sales is to be satisfactory, but the measures of publicity and display should be carefully calculated to attract the class of people who can be counted upon to purchase freely; for, after all, it is solely by the good round dollars gained that profit comes.

A Suggestion That Sold a Motor

FOUR years ago a central-station salesman stepped into a department store in New Jersey and suggested to the window trimmer that a lawn display with imitation grass, a splashing fountain, and a lawn-mower in the foreground would help sell a stock of lawn-mowers. To produce the fountain the central-station man loaned the store a small motor and a centrifugal pump. The display attracted so much attention that the merchant purchased the motor and pump and is still using this "property" in many window displays. The ingenuity of the window trimmer is continually being taxed to produce something new and striking. Suggestions to him pointing out some unusual use of an electrical appliance are, therefore, almost invariably appreciated and often result in the sale of whatever electrical material is needed to carry out the idea.

Local Price Maintenance

IN the study of local conditions on the Pacific Coast, which naturally was the feature of the convention pilgrimage, there was much comment upon the rapid evolution which is taking place there in the matter of local price maintenance. Several far Western central stations have recently made announcement of a change of policy which will aim to aid the dealer and the contractor in the development of a merchandising business. The medium will be the strict maintenance of a resale price which will permit and encourage the

smaller dealer to co-operate and participate in the work of market creation and in its benefits. Opinion in the industry is turning strongly against the sale of anything at cost or at a price which does not pay its way, and the dealer will appreciate that protection from an inequitable competition by the central station immediately opens up to him an opportunity of great promise. In fact, in those cities affected by the change in policy mentioned, the prominent contractors and dealers are already preparing plans for the establishment of modern electric stores and the improvement of their places of business, with full assurance of success. The vice-president of a leading Coast jobbing concern expressed the prevailing sentiment. "I feel confident," he said, "that within the next twelve months practically every central station in the Pacific Coast territory will have awakened to the new era through which we are passing and will adopt merchandising methods which will encourage rather than discourage legitimate merchants. It will strengthen the bonds of friendship between the various branches of the industry and will bring in the field a working force far greater and more lasting than organization or money can produce under existing methods."

Specifying Lower Voltage Appliances for Sizes Above 500 Watts

It is safe to say that there are many household electric heating appliances of 500 watts rating and larger in use on customers' premises which fail to give their owners the degree of service that the manufacturer and designer intended, or that, indeed, the selfsame appliances probably rendered when originally tested at the factory from a fairly constant-voltage source of supply. Voltage drop in the customers' lines is the cause of this difference in operating conditions on test and in practical use. Under ordinary circumstances, the central-station operating man measures the pressure at convenient locations in the residence district or districts of his city, and this value is usually taken for granted by the local commercial man in specifying voltage limits for his customers' appliances. But even the best of pressure regulation on the street wires or at the house switch does not mean that when a 500-watt or 600-watt appliance is in service, together with half the lamp installation of the household, the voltage at the end of the branch line from which the appliance is being fed will also be up to the parity of 110 volts—if that is the nominal pressure of the district. Indeed, the pressure measured at the terminals of such a 500-watt iron or stove while in operation is much more likely to be about 95 volts. This 14 per cent drop in voltage means a loss of about 26 per cent in the effective heating of the device. In few cases, of course, does the customer ever recognize the impairment of the usefulness of his iron or stove, even serious as it is. Knowing no better, he patiently tolerates the "slower" heating and diminished capacity in his device, although he may always afterward view with conservatism the claims of electric-cooking enthusiasts. The commercial manager will do well, therefore, when ordering 500-watt appliances for use on 110-volt circuits, to specify them as of 95 or 100 volts, instead of accepting the figure of the nominal lamp voltage. The heating elements will thereby certainly be operated much more nearly under the conditions intended by their makers, and correspondingly greater satisfaction will result to the users.

Standardizing Delivery Costs

Users of transportation service in a great many lines, including both merchandising and manufacturing, are facing a problem of their own. Plans can be worked out between the central station and the truck manufacturer which will help the user to meet these problems which face him and so develop a business which is profitable alike to the manufacturer, the central station, and the user.

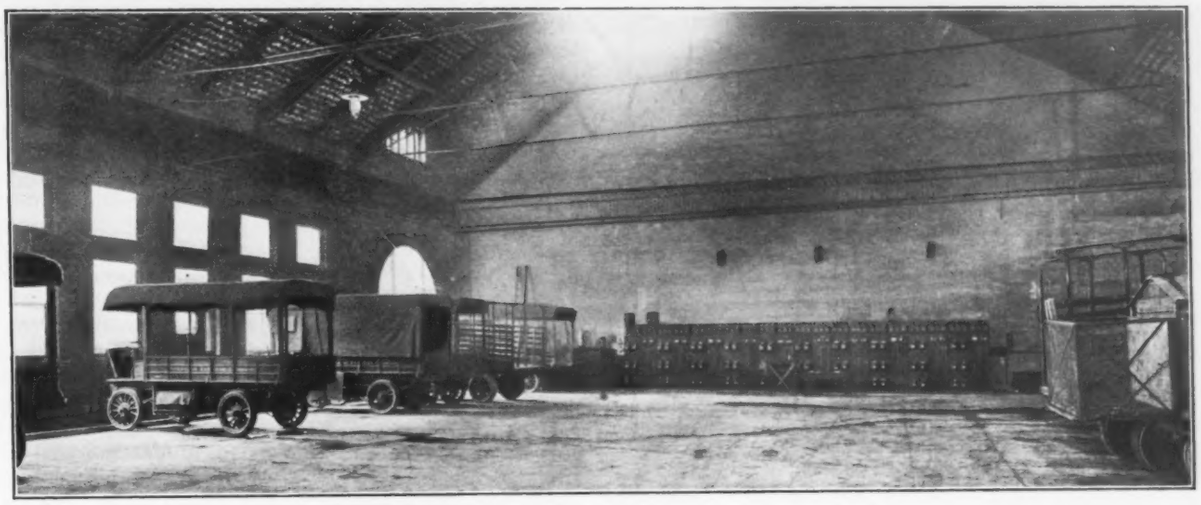
The cost of doing business in dozens of lines has been rising. There is scarcely a manufacturer or merchant who is not trying to standardize in some measure the cost of doing business. Groups of manufacturers and merchants in many lines are taking census of each others' costs in order to find a correct basis for all. Delivery charges form one of the elements in the cost of doing business in dozens of lines of manufacturing and merchandising.

It is obvious, therefore, that the central-station manager and the manufacturer can, if they will, market more vehicles, capitalize now the prospective user's needs by showing him at once how the electric vehicle may be applied to reduce his cost of delivery, and standardize this item in the cost of doing business.

Retail merchants, grocers, laundrymen, hardware dealers and others have combined to form co-operative delivery systems. This co-operative system is simply one method by which the dealer is trying to reduce the increasing cost of delivery service. If all those interested in the problem of selling more electric vehicles will see the opportunity to render a service to the users of such vehicles, a very real development in electric trucking can be made.

For years emphasis has been laid upon the particular value of the electric vehicle for meeting the average user's delivery problem. Mechanically the electric vehicle is almost, if not quite, as simple as a horse and wagon. All the minor ailments which group around a machine of any sort operating at high temperature, such as a gas engine, can be immediately dismissed from the mind of the merchant or manufacturer who buys an electric truck. For the manufacturer with local deliveries and short hauls or for the grocer who prefers to deliver sugar and butter unadulterated with gasoline, the electric truck obviously has advantages over the gasoline-driven vehicle in point of service.

The plan proposed in the following pages has been tested by a group of central-station managers and offers one solution of the problem of widening the use of electric vehicles which now faces the industry.



Increasing Business with Electric Trucks

Possibilities for Widening Application of Electric Vehicles and Adding to Central-Station Profits by Battery-Service System

SEVEN central stations have proved the value of a new plan for selling electric vehicles for commercial service. For three years this sales plan—the battery-service system—has been in successful operation in different locations and has stood the test of service under a variety of conditions. This plan is perhaps the first in which the needs of each of the three parties interested in the sale of trucks—the manufacturer, the central station and the user of the vehicle—have been considered.

Now is the strategic time for every central-station manager to interest himself in this method of increasing the sales of electrical energy. The time is opportune first because the prospective purchaser is right now scrutinizing the item of delivery cost in his costs of doing business; second, because the electric vehicle has certain specific advantages over any other type of vehicle for meeting the user's problem; and, third, because the war has caused an unprecedented situation in the truck-manufacturing field.

Why have no more electric trucks been put into operation? Primarily because of a misunderstanding between truck maker, central-station manager and truck user as to just what each had to offer and what their common interests were. The maker has furnished the vehicles and has thought of himself as selling simply an electric-driven truck. The central-station manager, recognizing the possibility of the truck as a means of selling energy, has thought of the vehicle as an energy-using device. But the primary interest of the user, the man both central station and truck manufacturer wish to reach, is in transportation with its clustering group of individual requirements. The user wants to buy transportation. And if a proposition can be made to him on that basis, a proposition that for the same or less cost gives him better delivery service, that is the proposition which will broaden the market for both the manufacturer of the vehicle and the manufacturer of the electrical energy, the central-station manager. Such a proposition has been put into practice by the central stations in Hartford, Boston, Baltimore, San Francisco, Fall River, Worcester and Spokane, in co-operation with the General Vehicle Company. It is called the battery-service system of the General Vehicle Company.

The Battery-Service System

The meat of the proposition is this. The truck user buys a truck with chassis and body adapted to his particular requirements without the battery. The central station keeps him supplied with charged batteries to run this truck. He goes to the central station, in other words, not to buy energy at so much per kilowatt-hour, but to buy transportation service. He pays the central station a flat charge for garaging and battery maintenance depending on the size of his truck. In addition he pays so much per mile for the total mileage traveled as indicated by the odometer on the truck.

Merely listing the advantages of this plan to each of the three parties concerned indicates far-reaching possibilities for widening the application of the electric commercial vehicle.

The user gets a simple, effective and modern vehicle of transportation for less money. The truck without the battery takes from 20 per cent to 25 per cent less capital at the start. In one stroke the user standardizes his delivery costs, cuts out his stable or garage expense, and buys transportation on a basis he can understand and measure.

Under the battery-service system of the General Vehicle Company, because the truck purchaser's original investment is reduced from 20 to 25 per cent, from the very practical viewpoint, the sale of the truck is made that much easier. The vehicle user merely operates the car. He need not concern himself with what may be to him the mysteries of electricity. There is no limit to the number of miles he can drive the car each day. Freshly charged batteries can be exchanged for a depleted set whenever unusual demands on the truck require it.

The centralizing of the income from the costs of delivery to the user at the central station has quite as practical advantages to the central station. This income

The Edison Electric Illuminating Company of Boston

APPLICATION FOR
BATTERY AND INSPECTION SERVICE
UNDER THE BATTERY SERVICE SYSTEM
OF THE
GENERAL VEHICLE CO., INC.

The undersigned, hereinafter called the Customer, hereby applies for Battery and Inspection Service for use in vehicles manufactured by the General Vehicle Co., Inc. and ordered or owned or used by him, as follows:

Size of Car....., Serial No.....

and agrees to be bound by the Terms and Conditions, and to pay the prices called for in the Schedule of Service System Charges of THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON, hereinafter set forth, and to use and pay for such service for a term of ..... years from the date of the first installation of said batteries in the Customer's vehicles, and thereafter until this agreement is terminated by ninety days' notice in writing given by either the Customer or the Company.

Dated 191

.....
Customer.

Dated.....191

The foregoing application is hereby accepted:

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON
By
.....

ACCOUNTING DEPARTMENT RECORD

Name
Address
Date

CAR		FIXED COSTS		REMARKS
SIZE	SERIAL NO.	SERVICE SYSTEM	GARAGE	

BATTERY & INSPECTION
FORM 1251
1M 5-15

WHAT BECOMES THE INSIDE FACE OF THIS CARD, WHEN FOLDED TWICE, CONTAINS A COMPLETE RECORD OF CONTRACT BETWEEN VEHICLE USER AND CENTRAL STATION

results from three sources, first, the garage charge, details of which will be presented later in this article; second, a ready-to-serve charge, based on interest, maintenance charges, renewals and freight; third, a charge for energy consumed reckoned for the truck user on a per-mile-run basis. Tabulated statements of income per mile as charged the user by the central station are shown with this article.

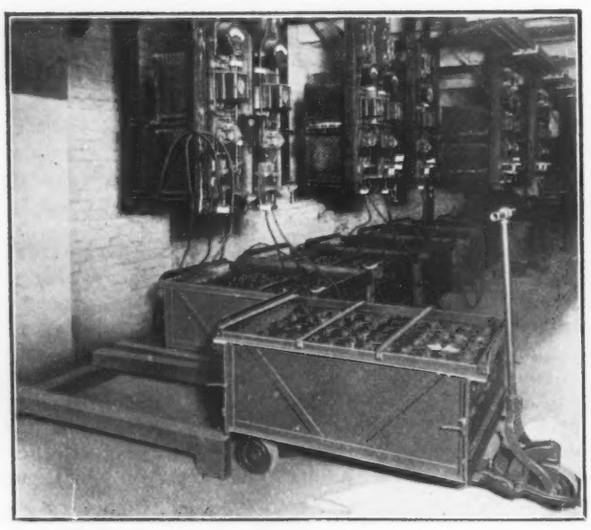
Just what each of the parties in the centralizing of transportation performs is made clear in the standard contract used by several of the central-station companies in developing this source of income in their respective cities. The contract has in some instances been printed on a 5-in. by 9-in. sheet so that when folded it may be filed in a 3-in. by 5-in. drawer as a record of the agreement in the office of the central station. The printed form of the contract, of course, may vary, but the essential elements are contained in this résumé:

Terms and Conditions of Contract

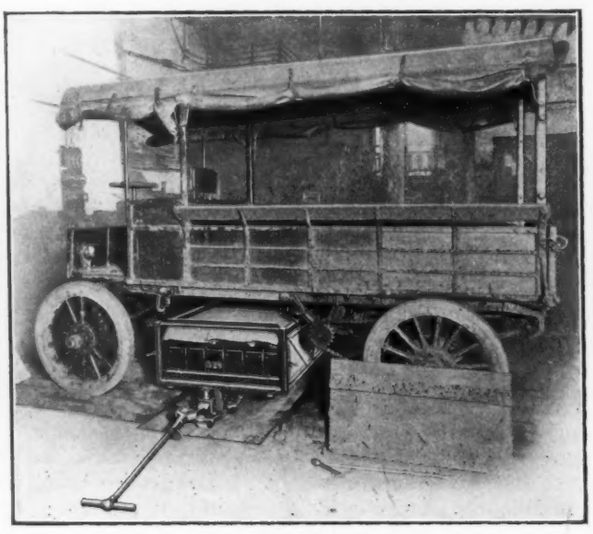
"To all owners or users of electric automobile wagons or trucks manufactured and equipped by the General Vehicle Company, Inc., for such service who will sign the application annexed hereto, and whose credit is satisfactory, the [insert here corporate name of operator], hereinafter called the company, will furnish battery service and inspection service as described herein, and also garage service if the customer so elects, upon the following terms and conditions:

"1. The company agrees to maintain a centrally located battery-service station with facilities for the rapid exchange of batteries, and with an attendant on duty day and night, and to own, maintain and supply all 'Ironclad-Exide' batteries necessary for the operation of said vehicles, and that it will at such battery-service station supply the customer at any and all times during the life of this contract, and equip his wagons or trucks (manufactured by the General Vehicle Company, Inc., and equipped for this service) with said 'Ironclad-Exide' batteries of sufficient size and proper number of cells ready for use, and will, without unreasonable interference with the use of the wagons or trucks by the customer, from time to time as said batteries become entirely or partially discharged either recharge the same or exchange them for and install in said wagons or trucks charged batteries in accordance with the schedule of rates annexed hereto.

"2. The company agrees that at the time of exchang-



CHARGED BATTERIES ON TRUCK READY FOR TRANSFER TO VEHICLE



HOW BATTERIES ARE RUN UNDER CAR PRELIMINARY TO NEXT STEP

ing or charging a battery it will furnish the customer's driver upon application with a coupon stating the number of miles which the battery should propel his wagon or truck under ordinary conditions. The company will make a towing-in charge for cars stalled by reason of exceeding the stipulated mileage.

"3. The customer agrees that the legal title to the batteries furnished by the company under this service shall be and remain in the company, and that he will return said batteries to the service station where such service is supplied at such times as shall be prescribed by the company's rules.

"4. The customer agrees to protect and care for the batteries while in his possession, and to return the same to the company in good condition, reasonable wear and tear thereof incurred in the normal operation of the vehicle excepted. The customer agrees not to make any repairs to the batteries but to notify the company.

"5. The customer agrees to supply a suitable odometer to register the number of miles traveled by each truck or wagon for the purpose of determining the price for the battery service in accordance with said schedule of service-system charges, and the company will have the same checked for accuracy at all reasonable times on the request of the customer.

"6. The customer agrees that the number of miles registered on the said odometer shall be the basis for computing all mileage charges in accordance with said schedule of service-system charges, and that if for any reason the odometer should fail to register, the mileage during the period of such failure shall be estimated from previous records on the customer's vehicles until such time as the odometer can be replaced or repaired by the company, and the customer shall pay the cost of repairing or replacing such odometer.

"7. The customer agrees that he will maintain his wagons or trucks, keeping them in repair and proper condition, and that he will allow the proper representative of the company to inspect or test his wagons or trucks at any reasonable time during the term of this contract for the purpose of ascertaining mechanical and electrical conditions and the accuracy of the odometer, and will immediately remedy any defective conditions called to his attention which would result in excessive energy consumption.

"8. It is mutually agreed that the company assumes no responsibility for the customer's wagons or trucks by reason of loss or damage due to fire, nor by reason of loss due to accident or other causes.

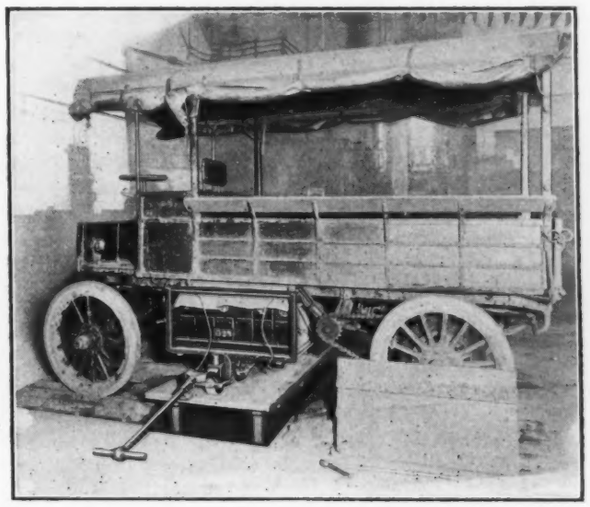
	Prices per Month					
	Boston	Spokane	Baltimore	San Francisco	Hartford	Charges Recommended*
1000-lb. wagon:						
Garaging	$19.00	....	$19.00	....	$8.33	$19.00
Battery service and inspection	17.00	$40.00	17.00	$42.50	14.00—	17.00
Rate per mile, 0 to 500	.03	.03	.03	.03	.03	.03
Rate per mile, 501 to 750	.02½	.02½	.02½	.02½	.02½	.02½
Rate per mile, 751 to 1000	.02½	.02½	.02½	.02½	.02½	.02½
Rate per mile, excess of 1000	.02	.02	.02	.02½	.02	.02
2000-lb. wagon:						
Garage	19.00	....	19.00	....	8.33	19.00
Battery service and inspection	21.00	42.50	21.00	45.00	21.00—	21.00
Rate per mile, 0 to 500	.03½	.03½	.03½	.04	.03½	.03½
Rate per mile, 501 to 750	.03	.03	.03	.03½	.03	.03
Rate per mile, 751 to 1000	.02½	.02½	.02½	.03½	.02½	.02½
Rate per mile, excess of 1000	.02½	.02½	. 2½	.03½	.02	.02½
4000-lb. wagon:						
Garage	19.00	....	19.00	....	10.00	19.00
Battery service and inspection	28.00	50.00	28.00	55.00	—	28.00
Rate per mile, 0 to 500	.05	.05	.05	.05	.04½	.05
Rate per mile, 501 to 750	.04½	.04½	.04½	.04½	.04	.04½
Rate per mile, 751 to 1000	.04	.04	.04	.04	.03½	.04
Rate per mile, excess of 1000	.03½	.03½	.03½	.04½	.03	.03½
3½-ton truck:						
Garage	23.00	....	23.00	....	....	23.00
Battery service and inspection	33.00	60.00	33.00	65.00	—	33.00
Rate per mile, 0 to 500	.06	.06	.06	.06	.06	.06
Rate per mile, 501 to 750	.05½	.05½	.05½	.05½	.05	.05½
Rate per mile, 751 to 1000	.05	.05	.05	.05½	.03	.05
Rate per mile, excess of 1000	.04½	.04½	.04½	.05½	.03	.04½
5-ton truck:						
Garage	26.00	....	26.00	....	....	26.00
Battery service and inspection	36.00	70.00	36.00	75.00	—	36.00
Rate per mile, 0 to 500	.07	.07	.07	.07	.07	.07
Rate per mile, 501 to 750	.06½	.06½	.06½	.06½	.06	.06½
Rate per mile, 751 to 1000	.06	.06	.06	.06½	.04	.06
Rate per mile, excess of 1000	.05½	.05½	.05½	.06½	.04	.05½

Garaging includes the garage space, washing, oiling, greasing and ordinary minor adjustments. If the vehicle is not garaged by the company, this charge is omitted.

Battery service and inspection include readiness to serve with electric energy in exchangeable batteries, to enable the customer to run his vehicle at any time, and inspection as to the condition of the vehicle at the station of the company.

*The charges in this column are those included in the contract form which the General Vehicle Company has standardized for the customer. These standards are based on preliminary experience accumulated by the different cities listed and by the General Vehicle Company. Variations in charges for battery service and inspection are caused by variations in freight rate on batteries. The standard charges for rate-per-mile costs tabulated in the last column are recommended by the General Vehicle Company as maximum charges after wide investigation and analysis of local conditions, rates for energy and so on.

"9. It is mutually agreed that the customer, if desiring to withdraw any of his wagons or trucks from service, may for a period of not less than one month have the charges for service for the same canceled, provided that advance notice is given the company in writing of his desire to do so. After such suspension



HOW BATTERIES ARE RAISED INTO POSITION UNDER THE VEHICLE

AN ELECTRICALLY DRIVEN WATERING CART AND AN ELECTRIC ROAD ROLLER

of service, the customer shall give at least two weeks' notice in writing of his desire to have such service reinstated. The charge for garage service shall not be canceled unless the customer withdraws his wagons or trucks from the garage of the company.

"10. All bills shall be rendered monthly and paid by the customer within fifteen days, and if not so paid, the company shall have the right to remove the batteries from the wagons or trucks. The company may serve written notice on the customer of his default, and if such bills are not paid within ten days after such notice, at the option of the company, this agreement may be canceled and terminated.

"11. Garage service shall consist of and include garage space, washing, cleaning, oiling, greasing and ordinary minor adjustments. If the vehicle is not garaged by the company, the garage charge in the annexed schedule is omitted.

"12. These terms and conditions shall not be binding upon either party until the signed application of the customer has been accepted by the company, and they may not be modified or affected by any promise, agreement or representation by any agent or employee of the company unless such modification is in writing and executed by a duly authorized representative of the company and by the customer."

The schedule of rates recommended by the manufacturer is presented later in the article.

Advantages of Centralized Control

One of the chief advantages in the method of sale as outlined in this agreement is that of centralizing batteries for the group of cars so purchased. Every central-station manager believes in the axiomatic principle of centralizing the production of electrical energy for a community or group of communities. The central battery-service plan is another extension of the well-recognized advantages of such centralization of the generation and distribution of energy.

The storage battery is merely another method of transmitting energy from a central source. It provides a method of transmission to the customer in a form which he pays for on a basis he understands. From the central-station viewpoint, moreover, the investment in batteries becomes productive as soon as made, and this investment is paid back to the central station on the installment plan by the service charge made to the merchant. The title to the battery remains in the hands of the central station.

The centralizing of the batteries makes possible a flexibility in handling the charging and maintenance of the cells otherwise impracticable. Charging can be put on a better time basis at the central station. It can be carried on in valley periods in the station load and, at the same time, experience has shown that the extra batteries available at the central source make possible a service to the vehicle user impossible when charging periods and maintenance are circumscribed by the comings and goings of one owner's trucks only.

At first sight, it may seem that the guarantee to supply fresh batteries at all times would mean an unusual investment in storage batteries by the central station. Practice shows, however, that such is not the case, and that the number of batteries required to give such service is not three or four times the total single equipment per vehicle but is a fractional proportion only of such extra batteries. The law of averages works to reduce the investment in batteries to a minimum, and the greater the number of trucks in service the fewer proportionally become the extra batteries required to guarantee a continuous service for the trucks. From one and one-half batteries per vehicle, with perhaps twenty-five trucks, it works down to one and one-third or less.

Centralization of the batteries also makes it possible for the central station to control the type of battery and to make engineering adjustments in character and type as may be necessary to fit the electric truck to the service which local conditions demand. Similarly, questions of initial battery cost and maintenance can be worked out with a large group of batteries more intelligently and at less expense per unit than is possible when the batteries to be recharged are scattered locally among a variety of users charged and maintained under varying conditions.

Results Obtained in Practice

Because of the average user's vital interest in reducing his costs of doing business, now is the time to present to him the advantages of the electric vehicle for putting the item of general delivery cost on a better basis. The fact that the plan has now been successfully tried in widely located sections shows the possibilities of its adoption for developing business in many other communities. Seven public service companies have adopted the plan—the Hartford Electric Light Company, the Washington Water Power Company, the Edison Electric Illuminating Company of Boston, the Consolidated Gas, Electric Light & Power Company of Baltimore, the Fall River (Mass.) Electric Light Company, the Worcester (Mass.) Electric Light Company, and the Pacific Gas & Electric Company of San Francisco. Each has adopted the battery-service system as a method of stimulating the sale of energy in their communities.

The plan was first adopted by the Hartford Electric Light Company of Connecticut. A description of the application of the system in that city was given in the Sept. 6, 1913, issue of the ELECTRICAL WORLD. The plan was introduced in February, 1912, with fourteen cars operating under the battery-service system. Two years later more than three times as many cars were in service, and in January of this year a gain of 50 per cent over the number of cars in operation during 1914 was accomplished.

Experiences of the several companies indicate that the main features of the plan can be applied under a wide variety of conditions. The initial trial of the system in Hartford was followed by two years' observation of the plan in operation. The officials of the Hartford Electric Company paid especial attention to advertising in the newspapers the adaptability of the electric vehicle to local use. Just what had been accomplished by local users and emphasizing in straightforward style the advantages of electric trucking formed the basis of this newspaper campaign. Repeat orders were capitalized in copy. One coal company substituted electric for gasoline-driven trucks and the discarded gasoline vehicles were offered for sale by the Hartford Electric Light Company. The advertising copy emphasized the fact that electric trucks had been substituted by the coal company. San Francisco and Spokane have also called newspaper advertising to their aid in promoting the battery-service system.

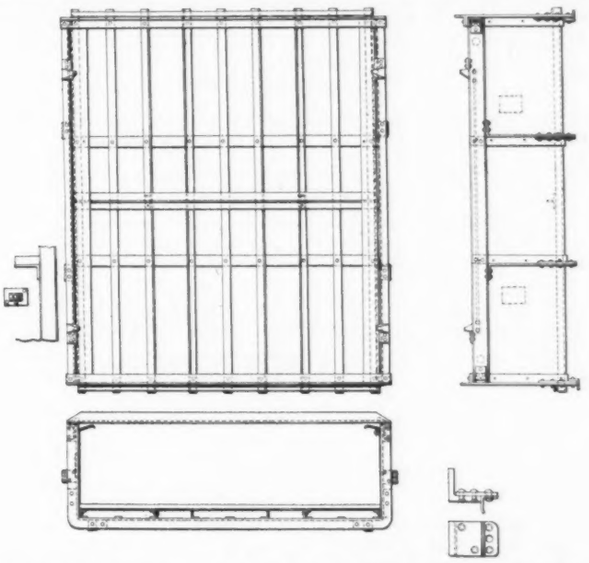
Adapting Trucks to Local Conditions

It may not be realized how much the leading truck manufacturers have done to standardize trucks to meet varying local conditions. In every case local conditions are taken into account before trucks are sold to users in that district. This is most important. The mere fact that any piece of electrical machinery will stand an abusive overload sometimes is a handicap in its operation. A vehicle adapted in motor and battery equipment for a relatively level locality may not be adapted successfully to a hilly country.

Consider Pittsburgh as an example. Little headway

was made in adapting the trucks to brewery service in that city until what might be held equal to an equipment for a 5-ton truck was placed in a 3½-ton vehicle. This same general plan was carried out in other sizes of trucks. On the contrary, 3½-ton battery equipment has been placed in a 5-ton ice truck when a half mile was an average haul and the smaller batteries were more than ample for a full day's work.

In other cases the size of the battery has been increased to take care of the extra current needed to operate an electric winch on the truck. This is not usually necessary. Extra large motors are applied to overcome sandy conditions in the South. Experience in Los Angeles developed the fact that owing to heavy rainfall the curbstones on the street gutters are from 3 in. to 5 in. higher than usual and iron-bound. This means that a truck going into a garage or stable would often have to climb a sudden rise of 36 in. (or a 33 per cent grade), bringing an extra heavy strain upon the frame. All frames that are sent to Los Angeles receive special care. In San Francisco, to negotiate the hills, batteries specifically adapted to the capacity of vehicle and the local routes have been installed. In one instance a special motor and a special battery equipment were used.



UNIVERSAL BATTERY CRADLE FOR MAKING DIFFERENT TYPES OF BATTERY INTERCHANGEABLE ON SAME VEHICLE

Particular attention is now paid to the installation of trucks in the smaller towns where the users have no knowledge of storage-battery practice and would naturally get into trouble with charging equipment if not properly coached. Special equipment has been furnished customers in cities where there is a heavy snowfall. Interchangeable bodies and false bodies which are placed inside the regular truck body so as to save time in loading and unloading have also been applied.

As in all enterprises, the success of any plan depends in the end upon some individual making himself responsible for putting the plan into effect. The central-station manager seems to have a special opportunity to promote the wider use of electric trucks, not only because he can sell more energy at a profit but because this is one of the ways in which he can capitalize the interest of his community in everything electrical. Just as the business man goes to his banker for financial advice, so it is natural for him to go to the central station for "electrical" advice, and the more the central station will afford the business man this service the greater will be his opportunity to increase the sale of electrical energy for all purposes in his community.

The Electric Passenger Car for Suburban Touring

With the development of automobiling the novelty of long tours has diminished until to-day the average automobile owner employs his car sanely for interurban runs during pleasant summer afternoons and Sundays.

THE EASY-GOING ELECTRIC "WALKS RIGHT UP" ANY COUNTRY HILL

For such tours and family parties afield the electric passenger car yields first place to no other type of vehicle, for, in addition to its simplicity and its ease of control by any member of the household, the modern electric automobile has a radius of operation on a single battery charge that is ample for the longest country trip the car owner is likely to undertake.

An interesting series of interurban runs has just been completed at Detroit by a local vehicle manufacturer, starting from the Detroit Athletic Club and making round trips over country roads to points of interest within 50 miles of the city. As the series was undertaken to demonstrate the value of the electric vehicle for suburban touring, persons interested in battery-driven cars were invited to go on the trips and some seventy-five made the little journeys on the twenty days of the runs. Stock Detroit Electric cars were used.

During the entire series, it is reported, not a single electrical or mechanical complication arose, nor was the car stopped at any time for tire trouble. The ladies seemed to appreciate especially the easy-riding qualities of the "electrics" on country roads.

DUSTLESS AND DELIGHTFUL ELECTRIC TOURING NEAR PONTIAC, MICH.

A Flatiron Sold Every Seven Seconds

Remarkable Figures from St. Louis for This Year on the One-Day Bargain Sale That Has Come to Be an Annual Feature

SOME people still maintain that bargain sales and "circus stunts" have no place in the business of an electric store. They say that the dealer, contractor or central station will do better by far to hold to the well-established selling methods of the industry and not to indulge in the spectacular. But here is the story of a bargain sale promoted by a burst of pyrotechnical publicity, and productive of the sale of 4273 electric flat-

ONE OF THE PRELIMINARY "TEASER" ADVERTISEMENTS

irons in a single day, enough, surely, to justify the selling plan, no matter what it is!

This record-breaking bargain sale was staged June 8 by Mr. C. E. Michel, manager of the appliance department of the Union Electric Light & Power Company of St. Louis, and it offered to the public a combination of a flatiron and a folding ironing stand at a fancy price. A General Electric 6-lb. iron that regularly sells for $3.50 and a special folding wooden ironing board, the latter made especially for the company and clearly worth $2.25 at retail at its normal department-store value, were sold for this one day only at the special bargain figure of $2.85. It was a bargain of exceptional attractiveness to every housekeeper, and in 4273 homes the response was prompt and hearty. The fact that the cost was to be distributed over a period of three months by a charge of 85 cents on the next electric service bill, and one dollar added on the two bills following, practically removed all consideration of cost.

Advertising the Sale

The publicity measures used to promote this sale were interesting. Ten days before the sale the company inserted in the St. Louis daily papers a "teaser ad"—in fact, two "teaser ads" appeared in each of the six local journals every day. No details were given. The purpose was to stimulate a general interest and curiosity. And the people of St. Louis were interested and they were curious, for these "teaser ads" were well done as the specimen reproduced here shows.

What followed next was guarantee of the attention of the entire city. A large force of men was sent out Friday night (the sale was held the following Tuesday) and before they stopped they had hung 45,000 yellow placards on front-door knobs, private letter boxes and in other appropriate spots until the residence districts throughout the city of St. Louis were bedecked with these announcements of the flatiron bargain sale. Simultaneously the company sent out 37,000 return post cards that bore postage stamps on both sides and provided both an advertisement of the sale and a form of order most convenient for the use of any purchaser.

On Saturday, therefore, nearly all the city knew about the sale, and 37,000 homes had at hand an easy, alluring medium for ordering a flatiron at the enticing price. Then on Sunday morning every newspaper carried a large display "ad" featuring the sale, and again on Monday another advertisement sent a final call, with further notice on the day of sale. In the meantime for six days prior to the sale all of the company's thirty-six electric trucks carried appropriate muslin signs, and the windows of the main office and display room and of the four branch offices were utilized to make a further feature of the sale. Tuesday came as the climax of a pressure of publicity that had affected the length and breadth of the city.

How the Orders Came

The orders came in so fast that it rivaled the most turbulent record of the proverbial "land office." On the opposite page is what the one-day bargain sale yielded.

OUR 1915 SPECIAL ONE-DAY SALE OF
ELECTRIC IRONS
Takes Place
Tuesday, June 8th
One Day Only
SPECIAL SALE PRICE
On This Day Only
$2.85
Standard Household Type 6-lb.
GENERAL ELECTRIC IRON
(Regular Price $3.50)
10 DAYS FREE TRIAL
Payments may be made 85c with first month's bill and $1.00 each with next two bills.
See Free Offer Below
THE "GLAD" IRON WAY
Means health, comfort, convenience and a cheerful Home
It's a real boon to the busy mother.
Saves countless steps
Hot in a minute
Less worry—more convenience
Does finer work
Banishes the hot stove
Works from any lamp socket
Nothing gets hot but the iron
It's true economy
Saves your health
GUARANTEED FOREVER TO CONSUMERS
FREE
FREE OFFER WITH EVERY IRON SOLD
A Full Size 15"x58"
FOLDING IRONING BOARD
Worth $2.25—For Which We Charge You Nothing.
FREE
UNION ELECTRIC SERVICE
A WONDERFUL OFFER
of which every housekeeper should take advantage.
UNION ELECTRIC LIGHT AND POWER CO.
12th and Locust 4012 Delmar 3012 S. Grand 3028 N. Grand
Bell, Main 3220 Kinloch, Central 3530
The Electric Company of Missouri
WEBSTER GROVES
CLAYTON
219 Meramec Ave.
WELLSTON
6306 Easton Ave.
LUXEMBURG
112 Le May Ferry Road
Customers of either company may order from any of the offices mentioned.

THE NEWSPAPER "SPREAD" THAT TOLD THE DETAILS OF THE SALE

861 people called in person at the main office and bought irons.
611 telephone calls were received from customers who found it inconvenient to visit the store.
1732 of the post-card orders came in through the mail.
655 flatirons were sold by the branch offices of the Union Electric Company.
460 irons were sold in Webster Groves by the Electric Company of Missouri, a subsidiary property.

4319 electric irons were therefore sold in this single day's bargain sale,
46 of which were subsequently returned for various personal reasons, so that the net sales were—

4273 flatirons that were actually sold and placed in service on the company's lines, to keep as many meters turning through the years to come.
The receipts from the sale were.....$12,178.05
The kilowatts connected total..... 2,350
The estimated kw.-hr. consumption per year is.....488,800
The annual revenue which will be secured from this business at 7 cents per kw.-hr. is estimated at $34,216.00

Within eight days after the sale every iron and ironing board had been delivered and signed for by the customer. Naturally the company is well pleased with the outcome of the sale, both as regards the number of irons sold and the actual financial result.

Results of Former Sales

And here is another feature of the sale that is of special interest. This was not the first time that St. Louis homes were given such an opportunity. A similar sale on June 24, 1912, sold 662 electric flatirons. Another sale on May 13, 1913, sold 1876 electric flatirons. And a similar sale on June 9, 1914, sold 2402 irons, and with every flatiron went a folding ironing board just as in the sale this year. It was a better ironing board this time—a full size 15-in. by 58-in. folding board of most substantial construction, built for the electric company by a local manufacturer. But the idea was the same. It sounded the same to the women of St. Louis, yet year after year the number purchased in the one-day bargain sale has increased. The *idea* was not new, but the bargain was appealing, and as means were taken to attract attention from a greater number, larger sales resulted and the irons were gobbled up at the rate of one every seven seconds all day long.

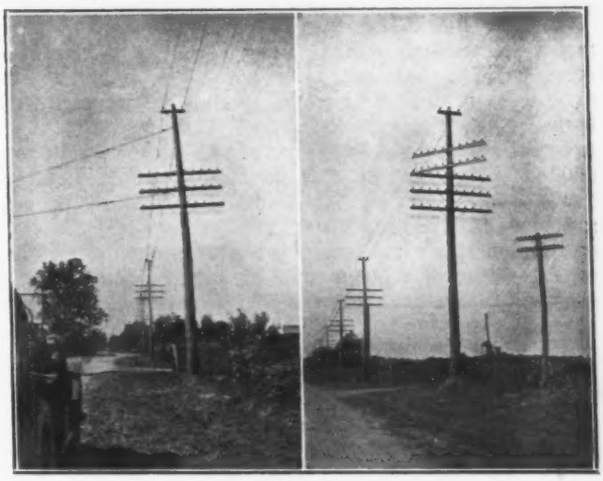
Let the man who never has believed in bargain sales consider well the facts in this experience of the Union Electric Light & Power Company. Though flatirons have been seen and advertised and sold in St. Louis for many years, though irons and ironing boards have been offered in a bargain sale four times before, the plan proved quite as popular and profitable as if the idea had been the veriest novelty. It proves that the people like the bargain idea, and that the more restrictions are placed upon it in the matter of duration of the sale, the more the bargain feature seems to be emphasized. It proves that a good idea in merchandising need not be abandoned for the reason that it has been used, so long as there are still prospective customers not yet reached and satisfied. It proves that, after all, the way to sell appliances is to make your proposition appealing and then to secure the attention of the greatest possible number of people. In other words, a bargain sale, well advertised, is still the most effective trick of merchandising.

"Movies" Equipped with Sliding Roofs Attract "Air-Dome" Patrons

A number of motion-picture theaters in New York City are equipped with motor-operated sliding roofs which can be opened on warm nights to give the effect of open-air theaters. On the bulletins displayed in front of these theaters are some such headlines as "Enjoy the Comforts of an Open-Air Theater Without Being Forced to Leave on Account of Rain." This appeal was very effective in attracting patrons away from the so-called "air-domes" on account of the unusually rainy weather which prevailed during the early summer.

Joint Line Solves Rural-Service Problem

On a stretch of road in Hamilton County, Ind., where the lines of the Noblesville Heat, Light & Power Company parallel those of the Bell Telephone Company, a joint-pole line has been erected. With the farm-service lines of the electric-lighting company on a standard two-pin telephone cross-arm at the top of the pole, and the fifteen toll circuits of the Bell company on three

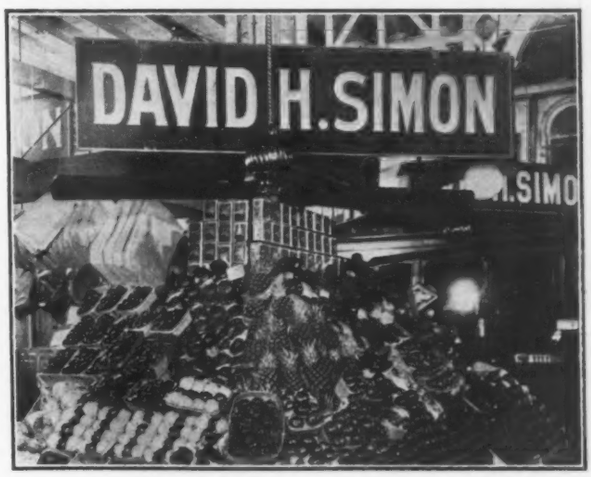


JOINT-POLE LINE SERVING INDIANA FARMERS

ten-pin arms beneath, the line presents that well-balanced appearance which typifies sturdy construction. The work of erecting and transferring the electric-lighting wires from existing pole lines was done by the workmen of the Bell company.

"Breezeless" Fans as Fly Chasers

A special type of electric fan has been installed in the Reading Terminal Market, Philadelphia, Pa., to frighten flies away from exposed food by means of moving shadows. Forty-two of these fans, which are of Robbins & Myers manufacture, are being operated in the market. The fans run at 100 r.p.m. and have their blades set at a very slight blade pitch so that practically no breeze is developed. The blades have a sweep of 90 in. The moving shadows caused by the blades are said to be very effective in eliminating the fly nuisance; at the same time the dealers are not troubled with strong breezes which are likely to blow light objects away.



THE FAN'S SLOW-MOVING SHADOW "SHOOS" THE FLIES

Use of Electricity in a Dental Infirmary

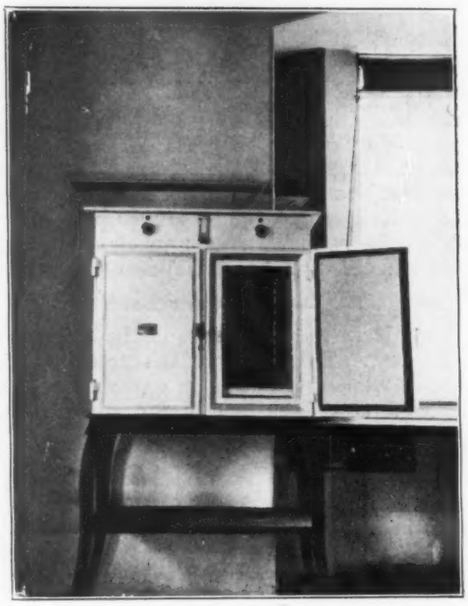
The Elaborate and Modern Equipment of the New Forsyth Institute at Boston—Dentists' Operating Chairs with Self-Contained Electrical Accessories

THE electrical equipment of the new Forsyth Dental Infirmary at Boston, Mass., illustrates the increasing usefulness of modern lighting, motor-driven and signaling apparatus in institutional service. The building is a notable addition to the extensive group of medical and educational structures in the Fenway district of Boston, and with its present equipment was erected at a cost of about $500,000, through the gift of Messrs. John Hamilton Forsyth and Thomas Alexander Forsyth, to provide gratuitous dental treatment to children of sixteen years and under. The institution is a pioneer in the work of oral hygiene on a large scale among the children of a great city. With its present facilities three treatments annually can be given to 76,800 children, while the ultimate facilities available will be 381,600 treatments per year. An endowment of $2,000,000 is provided for the maintenance of this philanthropy.

The building is of handsome design, faced with white Vermont marble. It consists of three stories and two partial mezzanine floors. The center of interest is an infirmary room, extending along the entire north side of the building, 28 ft. high inside and occupying the major portion of the second floor. Ample waiting-room facilities, a research laboratory, a library, offices for the executive and clerical staff, a clinical amphitheater, sterilizing room, machine shop, power plant and other departments form a part of the institutional arrangements.

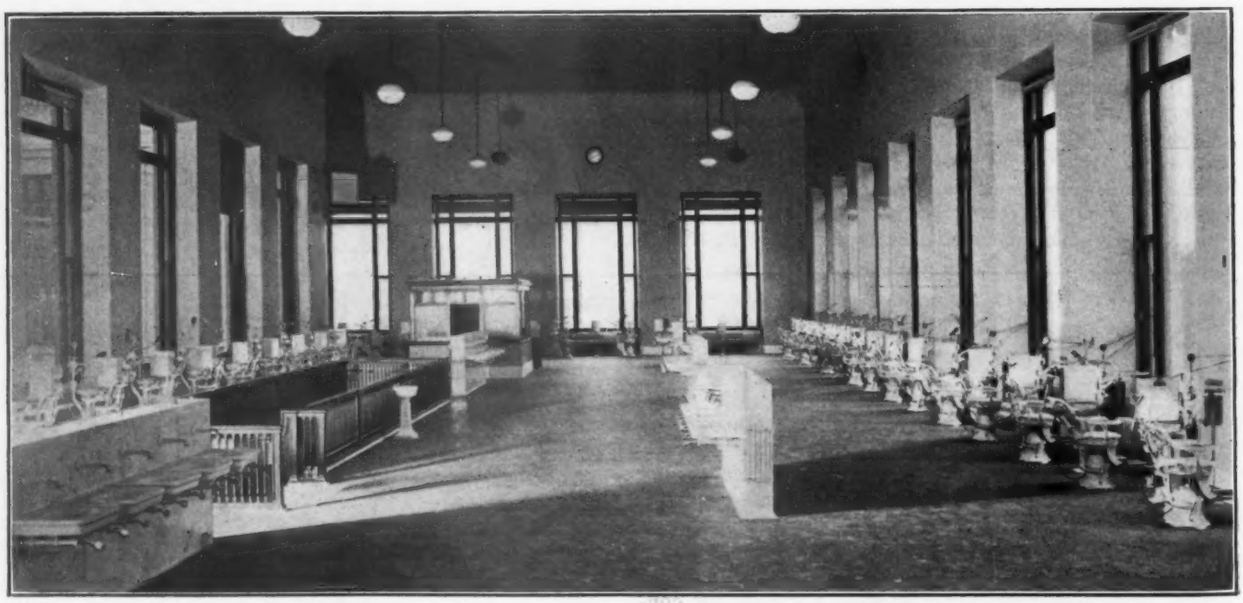
Plant Electrical Equipment

An electric generating plant was installed in the sub-basement for daytime service, the small amount of energy required at night being furnished by the Edison Electric Illuminating Company of Boston, which also has an emergency-service connection with the building. Two 25-kw., 110-220-volt three-wire direct-current generating sets are installed in the engine room, each being direct driven by a 41-hp. Ridgway simple non-condensing engine. The sets are alternated in service daily, one unit being ordinarily more than able to handle the load. Each unit is mounted on a 20-in. concrete base, 12 ft. long by 20 ft. wide, resting on a 1-in. layer of ground cork between the slab and the floor, which is below sea level.



LABORATORY ELECTRIC INCUBATOR

In laying out the plant the size of the generators was largely determined by the requirements of a 1500-lb. Otis electric elevator serving the three floors of the building. Ordinarily such an elevator requires a 15-hp. motor for a speed of 200 ft. per minute, but by rewinding the motor and introducing a greater amount of starting resistance it was found that a motor of 5-hp. rating would provide a speed of 100 ft. per minute, and

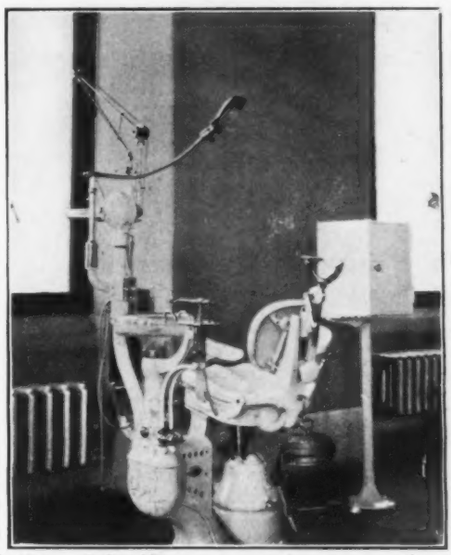


SIXTY-TWO ELECTRICALLY EQUIPPED CHAIRS IN MAIN OPERATING ROOM OF FORSYTH DENTAL INFIRMARY, BOSTON

would require no storage battery in reserve, as was originally planned. By this means the capacity of the generating plant was reduced from 35 kw. to 25 kw. per set.

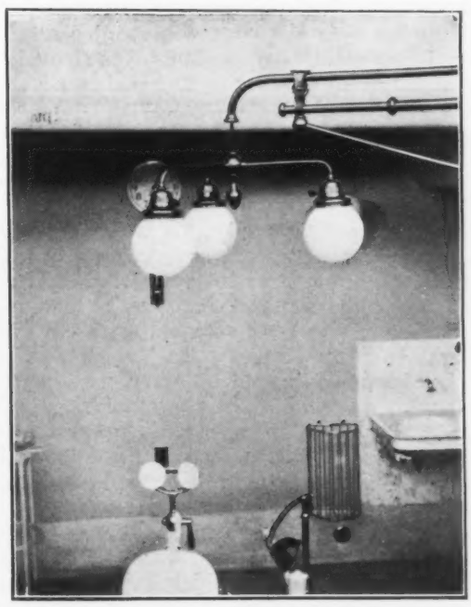
The Main Operating Room Containing Sixty-two Chairs

The main infirmary room, measuring 160 ft. by 70 ft.,



ONE OF THE OPERATING CHAIRS, SHOWING LAMP, DENTAL ENGINE AND FOOT-CONTROL SWITCH HUNG ON HOOK

at present contains sixty-two S. S. White dental chairs, each provided with a motor-driven dental engine installed on the frame of the chair and a foot-control switch, which is suspended from the frame when not in service and is placed on the floor when in use, giving



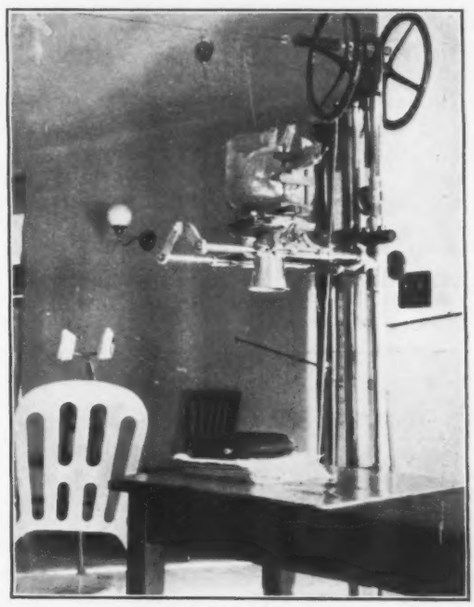
ADJUSTABLE THREE-LAMP BRACKET IN CLINIC ROOM

four speeds in both forward and reverse directions. There are no wall outlets or exposed circuits, the wires entering the chair through floor conduits. Each motor is rated at 186 watts and, in common with the metal fittings of the infirmary, has an enameled frame without corners, facilitating the maintenance of antiseptic conditions.

Each chair is equipped with four push-button switches operating annunciator calls. One is in circuit with an annunciator board with 110 numbers, installed in the waiting-room lobby, and is used by the dentist in charge of the chair to call his next patient. The second button is for summoning supplies from a central stockroom, two boards in duplicate being installed on the wall at the angle of each wing, about 14 ft. above the floor. A third call is connected with a board in the supply room and signals the bringing and removal of instrument trays. The fourth switch, with a ruby lamp in circuit, enables the operator to acknowledge a call from the clinic room, on receipt of a signal to proceed there to witness demonstrating operations. Each chair is provided with a 40-watt lamp on a flexible bracket, with a sectional reflector.

Sterilization of Instruments

A complete outfit of sterile instruments necessary for ordinary operations is sent to each operator on call for each patient. These outfits are contained in metal trays which can be mounted on a pedestal at the chair close



X-RAY MACHINE FOR MAKING SKIAGRAPHS USED IN DENTAL DIAGNOSIS

by the motor. When patients are dismissed the instruments and containing trays are collected in trucks and taken to the cleansing and sterilizing room. A tepid-water supply for rinsing fountains and syringes at the chairs is circulated by a Goulds centrifugal pump operated by a 5-hp. direct-connected Crocker-Wheeler 220-volt motor, the system being provided with a 600-gal. storage tank in the basement and piped for continuous circulation without the formation of pockets, thus insuring a supply at the requisite temperature. A similar motor-driven equipment is in service for the supply of hot water to the lavatories, with a 400-gal. storage tank. Numerous washstands of the hospital operating-room type are placed at convenient points, so that one at least will be within easy access of each operator. Thirty electric hand driers will shortly be installed in this connection.

Instrument sterilization is accomplished by two gas ovens in the basement, equipped with ½-hp. fan motors which force hot air through portable racks of instruments in cases with open slides. A small motor is provided in the sterilizing room with double brush equipment to facilitate polishing and cleaning drills, and a

White 110-watt motor-driven reversible dental lathe is used in a laboratory connected with the orthodontia room for shaping mouth fittings. Six 0.5-hp. to 0.75-hp. fan motors are in service, and other motors include a 1-hp. vertical Eck motor on a sump pump in the boiler room, a 3-hp., 220-volt Payne ash elevator, two 3-hp. motors driving pumps supplying air-washer shower heads, a 5-hp. Otis elevator motor, and a 1-hp. General Electric motor operating a lathe and emery wheel in the machine shop. A 0.5-hp. motor also drives a 10-volt, 20-amp. Fort Wayne generator for service in operating telephone, call-bell and annunciator systems. At night these systems are supplied by a nine-cell alkaline storage battery in the engine room.

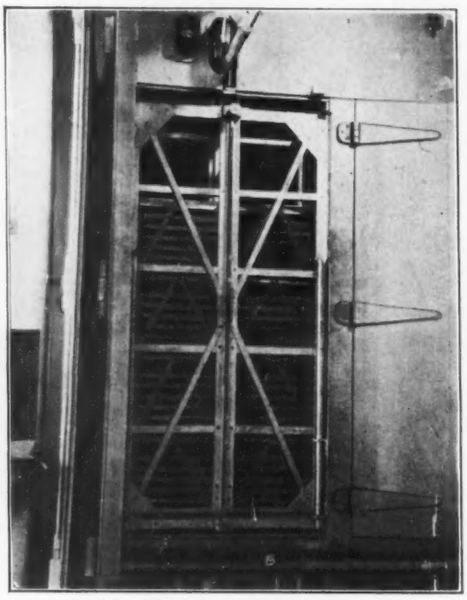
At the infirmary electricity is also used to eliminate the pain attending certain operations involving the deadening of nerves, treatment of pyorrhœa, etc. A "galvanic controller," manufactured by the Victor Electric Company, and operated on a 110-volt direct-current circuit, is employed. The process consists in forcing neurocaine into the nerves of sensitive teeth, gold or platinum foil being used to make the positive contact, while the negative contact is made on the patient's wrist. For deadening a nerve, a current of from 2.5 to 3 milliamperes is applied for one minute, and for the pyorrhœa operation the current is applied from one to three minutes. Teeth formerly so sensitive that no work could be done upon them can now be rendered permanently painless and used as the abutments for bridge work. About nineteen of these equipments are in use in Greater Boston.

Lighting the Infirmary Building

The general lighting of the infirmary room is by means of sixteen groups of four 100-watt tungsten

BRONZE LAMP STANDARD AT ENTRANCE TO INFIRMARY

lamps each, with 24-in. bowls, the lower half of the bowl being of alabaster and the upper half of verre moulé, installed 6 ft. below the ceiling with brass tubing. This type of lighting is generally employed throughout the building, the library and waiting rooms being lighted by 20-in. bowl fixtures containing three 100-watt lamps each and the corridors by 12-in. acorn-shaped fixtures containing three 60-watt lamps in each case. In settling upon the lighting scheme an extended study was made of various types of glassware. Alabaster



STERILIZING OVEN, IN WHICH USE IS MADE OF ELECTRIC AIR-CIRCULATING FANS

was found to be most suitable for the service requirements, the best type giving only about 7 per cent less light transmission than the best illuminating glassware, besides presenting a more artistic appearance. Inferior grades of alabaster gave from 63 to 35 per cent of the light transmission of glassware. The position of the lamp in the bowl was studied also, and it was found that great care must be taken to avoid cracking the alabaster on account of its sensitiveness to heat. For this reason the use of gas-filled lamps was not considered desirable. Operating ceases in the infirmary at 5 p. m. daily.

Miscellaneous Electric Equipment

The main entrance is flanked by two handsome ornamental bronze standards, each supporting a 16-in. translucent ball containing three 100-watt lamps. The equipment of the building also includes a loud-speaking telephone system and a 1.5-amp., 110-volt electric incubator for laboratory service. On the mezzanine floor above the infirmary room is an X-ray department equipped with a Kelley-Koett photographic X-ray machine, with regulating switchboard. There are electric clocks in various rooms, supplied by the Standard Electric Time Company, Springfield, Mass. All clock faces are flush with the walls for sanitary reasons, with control from a master clock which is installed in the director's room.

The clinical amphitheater, which has concrete benches and is arranged for complete flushing by hot water and disinfectants, is furnished with an electric surgical unit, with chair and signal system, the special lighting being provided by three 60-watt lamps inclosed in frosted-glass balls. A local 40-watt lamp is also available at the chair.

The electrical installation of the Forsyth Dental Infirmary was designed by Mr. Thomas W. Byrne, consulting engineer, Boston, Mass., Mr. L. Fisher being superintendent of the building.

Merchandising Methods

A "Big Iron Slide" at Paducah, Ky.

When electric irons were reduced in price for one week at Paducah, Ky., the Paducah Light & Power Company called the sale a "big iron slide." The irons "slid" in price from $3.50 to $2.50, and to carry out the

A WINDOW DISPLAY WITH ACTION IN IT

idea that irons had really "gone down," the window display shown herewith was arranged.

To the casual observer the iron in the center of the display appears to have slid down the inclined board and to be lodged half-way through the large plate glass. In reality, however, the glass is not broken, but the effect was produced by cutting the iron into halves and fixing one-half of it on each side of the glass. The shattered appearance of the window was produced by pasting thin pieces of broken glass on the large plate glass near the supposed hole, and sketching in the radiating cracks on the plate glass with a piece of white soap.

A Real Estate Firm's Success with Electric Ranges in Apartments

In a recent interview with a representative of this journal, Mr. Edward P. Fitzgerald of the Colonial Real Estate Trust, Worcester, Mass., stated that excellent operating results are being obtained from the electric ranges in the eighteen-suite apartment house erected by his company on Irving Street, Worcester, and to which occasional reference has been made in these columns.

"We became interested in the electric range," said Mr. Fitzgerald, "through the renting of one of our apartments by President Rollins of the Worcester Electric Light Company. We investigated the subject of electric cooking at considerable length, talked with representatives of electric-heating companies, and decided to spend over $1,000 in such equipment in our new Irving Street residence apartment, believing that the absence of coal and gas ranges in these apartments would appeal to the public as an up-to-date move. No extra rent has been charged on account of the exclusive use of electric cooking in this building. The people who moved in are finding the cleanliness and comfort of electric ranges highly satisfactory. There is not a foot of gas pipe in the building, the continuous hot-water service being provided from a single coal range in the basement which is kept in service by the janitor.

"The time is coming when water will also be electrically heated for domestic service. We believe that in a few years electric cooking will be the regular thing, and our experience with this pioneer installation warrants us in the decision to adopt the electric range in future high-class apartments built by us. These apartments rent for from $40 to $45 per month. At present we are using both Simplex and Hughes ranges, and the cost, while slightly above gas-range service, is well warranted by the superior results gained."

Figures gathered by the Worcester Electric Light Company show that the average cost of energy per month for a family of three persons in these apartments is from $2.50 to $3.

Summer Burglars and Electric Light

"Don't Shoot the Burglar!"

Under the foregoing caption the central-station company in an Ohio town recently did an effective bit of "good-will" advertising in its community, as recounted by Mr. E. Burt Fenton, manager of the publicity department of W. S. Barstow & Company, in his paper presented before the convention of the Ohio Electric Light Association this week.

The advertisement mentioned called attention to the fact that the average member of the prowling gentry is a better shot than is the average householder; that when the latter shoots he is more likely to hit a member of his own family than the maurauder, and that in the dark the advantages are all on the side of the burglar. Then it was pointed out that the one thing the burglar actually dreads is light. The advantages of electric light were exploited in a few words.

Aside from its commercial moral, the chief value of the advertisement, declared Mr. Fenton, lay in the concern expressed by the company for the people of its community.

Selling House-Wiring at Manchester, N. H.

In connection with an energetic house-wiring campaign it conducted, the Manchester (N. H.) Traction, Light & Power Company displayed in the window of its main office two effective groups of fixtures wired for demonstration, as illustrated in the accompanying halftone. The company features sets of fixtures adapted to the average house at $52 and $60, accepting either cash or installment payments, the wiring being done at this price by arrangement by any of the five local contractors. To attract attention to the window a 16-in. oscillating fan standard placed in the center carries a life-sized figure of a

THE WHOLE HOUSE-WIRING STORY IS TOLD IN THIS ATTRACTIVE EXHIBIT

girl holding a 40-watt tungsten lamp with half-frosted bulb mounted in an enameled metal reflector, which throws a moving beam of light upon the sidewalk outside the building, searchlight fashion.

In the foreground of the window are samples of circular loom and rubber-covered wire as used in house wiring, and a group of cardboard houses emphasizing that all classes of residences are available for electric service. A striking exhibit not shown is a photograph of a house built in 1713, which was "not too old to be wired." In extensive newspaper advertisements the company is calling attention to the ease of modern house wiring—the absence of disturbance to furniture, walls, ceilings and the "household gods" when the modern electrician starts work in a residence.

Follow-Up Card Index of New Buildings

In order to record new construction both of residences and stores, and the conditions relating to electrical connection and installation thereof, the Salem (Mass.) Electric Lighting Company has adopted the follow-up

J F M A M J J A S O N D		
About	Street	NEW BUILDING CARD
No.	Avenue District	
Cor.	Street N. E.	
Near	Avenue S. W. Side	
Owner	Address	
Archt.	"	
Builder		
Permit	Est. Cost $	Est. Rental $
To be for: Dwelling	Apartments	Stores
		Garage
For Sale	For Rent	Owner to occupy
Being Built		Finished
To be Wired: Voluntarily	At Solicitation of Co.	Being Wired
Wiring Finished	Wg. Contractor	
Fixtures Installed: Electric	Combination	Gas
Not Wired: Should have Wired	Too Cheap	Will not build
Ready to occupy about	Can't Supply	
Not Started	No. of Prospects	Est. Income $
		Agent

NEW-BUILDING "FOLLOW-UP" SIDE OF CARD

form shown herewith. On June 25, 1914, a large part of the city was devastated by fire. Since that date, up to May 19, 1915, 484 permits to build had been granted. While all of these buildings are not yet erected, of those that have been 352 are wired for electricity, and 280 connected with the central station's service. The percentage of wired buildings is 97, of which 54 per cent are provided with electric service only.

In securing this new business the follow-up building card has been of much service. On one side are noted the location, owner, builder, cost, rental price, lighting provision, and progress, and on the reverse side are blank spaces to be filled in with the applications for service, the nature of the service and other details.

Suite No.	APPLICATION SIGNED Name	Date	
Public			Electric Elevator
1			Builder's App.
2			Service Pipe Up
3			Service Run
4			
5			
6			
7			
8			
Warrant	191 $		Service to be O. H.—U. G.
Pvt. Prop. Cost—Customer to pay $			Not necessary to get locations

BLANKS FOR DATA ON SERVICE CONNECTIONS

St. Louis Campaign on Gas-Filled "White-Way" Units

Having already sold more than 11,000 of its earlier "white-way" units—large tungsten lamps in inexpensive fixtures designed for outdoor or indoor application—the Union Electric Light & Power Company of St. Louis, Mo., is now offering its patrons an improved "white-way" unit. Although identical in price with the former type of fixtures, the new units, which are equipped with gas-filled tungsten lamps, will, according to the company's advertising circular, give with the same energy consumption 30 per cent more light than the former "white-way" lamp.

OPEN-BALL INDOOR-TYPE FIXTURE

The fixture for indoor service consists of a canopy, suspension chain, metal hood and open-base inclosing ball. Fitted with a 300-watt lamp, this lighting equipment is sold to the company's customers at $5.75. The unit complete can be bought on a deferred-payment plan at the rate of 35 cents a month, the company agreeing to clean the equipment at regular intervals free of charge. The outdoor fixtures are similar to the indoor type, with the exception that a suspension bracket of malleable iron is used in place of a chain and canopy.

Mr. F. D. Beardslee, sales manager of the Union Electric Light & Power Company, confidently expects the future sale of these open-ball fixtures to equal the unusual record established by the "white-way" lamps during the two years in which they were offered to the company's customers.

"This Theater Is Electrically Cooled"

Visiting one of the town's leading moving-picture houses, the manager of an Eastern central station was gratified to find the darkened auditorium agreeably cooled by electric fans. Outside in the lobby, however, the heat was so oppressive that a casual passer-by would have inferred that the interior would be equally uncomfortable. On his way out, therefore, the central-station man suggested to the picture-house proprietor that an electric fan be placed in front of the lobby, practically on the street line, with colored-ribbon streamers attached to its guard, to float outward in the breeze and direct public attention to a sign nearby: "This house is electrically cooled." The manager thought so well of the suggestion that he installed it, and since that time other local "movies" have annexed the same idea to share in his success.

A Window Display That Stopped the Hurrying Throng

In the striking window display used by an Ohio central station a dummy arm protruding through a hole in a large placard waved a handkerchief at a broom in one corner of the window. On the card was the legend: "Good-by, old broom; the electric vacuum cleaner has come to take your place." The continual motion of the arm waving the handkerchief stopped many hurrying pedestrians.

Efficiency and Comfort in the Home

The United Electric Light & Power Company of New York City Demonstrates in a Model Electrical Apartment How These Essentials of Perfect Domestic Life Are Contributed by Electricity

Interior Construction

Cutting Hole in Plaster Wall for Distribution Cabinet

By Anthony Gorman

In wiring finished buildings it is necessary in practically every installation for the wireman to cut a relatively large hole in a plaster wall or partition for the reception of the distribution cabinet. If he proceeds with this work in accordance with the methods described herewith, which experience has shown to be

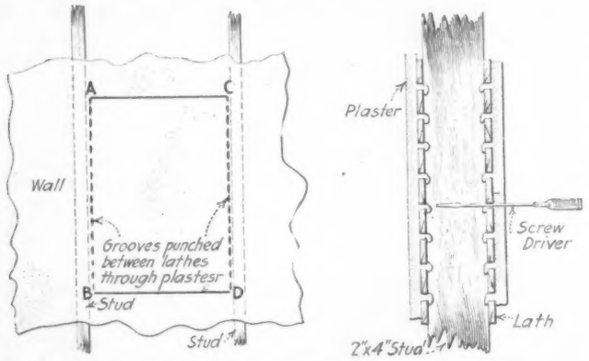


FIG. 1—PUNCHING GROOVES IN THE PLASTER

the most effective, he will save himself both time and worry.

Usually the cavity or pocket for the reception of the distribution cabinet extends the entire distance between two adjacent studs. After the wireman has decided upon the approximate location of the distribution cabinet, a small screwdriver should be pushed through the plastered wall between two laths in order to determine the location of a stud, which can be previously found approximately by tapping on the surface of the wall with a hammer. The screwdriver is pushed through the plastered surface as shown at the right in Fig. 1, care being taken to get it as near as possible to the face of one of the studs so that the screwdriver will slide into the space in the partition and lie against one of the studs. A trial or two may be necessary in order accurately to determine this stud location.

After the location of the face of the stud has once been determined the wireman should punch along the stud face through the surface of the partition a series of holes for a distance equal to the length of the distribution box that is to be placed in the pocket. Another similar series of holes is pushed through the plaster along the edge of the next adjacent stud, and

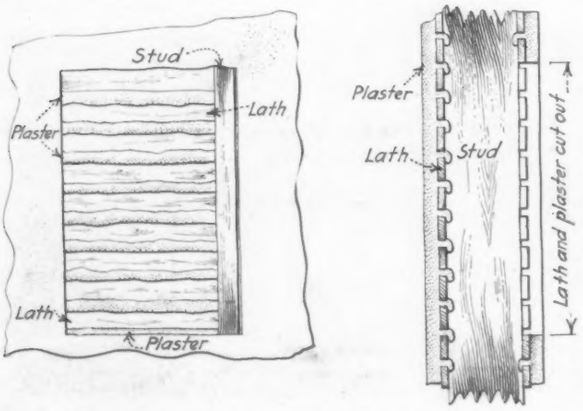


FIG. 2—ELEVATION AND SECTION OF COMPLETED POCKET

then a groove is made through the plaster at the top and bottom of the distribution-box location with the screwdriver. The two lines of vertical holes having been punched through the plaster and the two horizontal grooves cut, the exterior of the wall will appear as indicated at the left in Fig. 1. All the plaster within the rectangular area should then be chopped out in cakes with a screwdriver or a chisel. The laths are next cut with a compass saw along the lines *AB* and *CD*, and the pocket will appear as shown by the front-elevation and cross-sectional views in Fig. 2.

The distribution box can now be fitted into the cavity *ABCD*. If the box is to be made of wood lined with asbestos or of sheet metal, it should be proportioned to fit exactly within the pocket. If a metal distribution cabinet purchased from the stock of an electrical-supply house is to be employed, the workman may find it necessary to nail spacers or battens onto the faces of the two studs in order to insure that the metal distribution cabinet will fit snugly when inserted in the pocket.

Special Fixture for Low-Ceilinged House

The use of ceiling fixtures in old houses which are low of ceiling is often difficult or impracticable, owing to the lack of headroom. In certain cases the central fixture in a room with low ceiling has to be guarded by means of a table set directly underneath. This is but

CEILING FIXTURE FOR AN OLD-FASHIONED ROOM

a makeshift since in case the table is removed for any reason both heads and fixture are in danger. To obviate this difficulty, the electrical contractor wiring a house in one of the older suburbs of Boston devised a means by which to utilize a shower fixture which would be of such small vertical dimension as to allow ample headroom for tall people.

A special fixture was made up by removing the vertical socket and nipple from each unit in a regular three-lamp brass shower, casting a new angle-nozzle with a threaded tap in the side at a 120-deg. angle from its axis, and attaching the pull-chain socket and nipple to the flat ceiling pan, which was installed on the central timber which projects 2 in. below the ceiling. The three lamps in each fixture are set in a staggered position in relation to one another. The sockets, being at an angle of only 30 deg. from the ceiling of the room, effect an economy of about 4 in. in height, and leave headroom of 6 ft. 2 in., whereas with a usual shower fixture the headroom would be insufficient for a person even of moderate height to pass underneath. The parlor and living room of this old New England farm type are thus comfortably equipped.

Lighting Practice

LIGHTING THE PAGEANT OF LEXINGTON

Projector Illumination of Natural Amphitheater—Use of Novel Steam Curtain During Scene Changes

BY L. C. PORTER

On the nights of June 21, 23, and 24 the citizens of Lexington, Mass., gave an outdoor pageant commemorating one hundred years of peace between England and America, the proceeds of the pageant being devoted to the work of the American Red Cross.

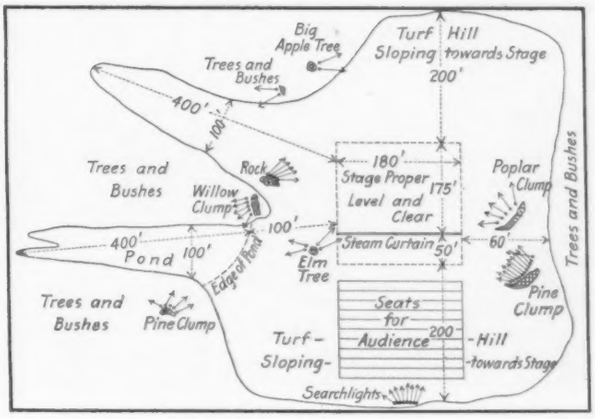
Nearly 900 people in costume took part in the pageant alone, while, including the workmen, the boy-scout ushers, etc., about 1000 persons were necessary for the production. The pageant showed in episodes of dramatic form the part which the old town of Lexington has taken in the history of the American nation.

The pageant was staged on the property of the Twin Elm Spring Company at Lexington, which afforded an almost perfect natural amphitheater, as shown in the accompanying plan. In the center was a level field, closely mowed and rolled, for the stage proper, 180 ft. long by 175 ft. deep. On a gently sloping hill facing this stage were constructed 6000 seats for the audience.

With the exception of the large orchestra, the entire pageant was lighted by projected light. Thirty-nine flood-lighting projectors, each containing one 500-watt Edison tungsten flood-lighting lamp, were distributed around the grounds, as indicated on the accompanying plan. The arrows give the general direction in which the beams were trained. The beams varied in spread from 6 to 18 deg., depending upon the distance they were to "carry." The projectors were grouped in batteries and hidden from the audience either by natural screens, such as large rocks, or by clumps of cedar trees cut and set back of them for the purpose. From no part of the grand stand was a source of light directly visible.

Supplementing the flood-lighting projectors, eight 20-in. searchlamps, each containing a 750-watt focus-type Edison tungsten lamp, were mounted 20 ft. above the ground at the rear of the audience. Six of these had their beams spread fan-shaped, covering the main stage and adjoining ground. The other two were focused into spotlights, to follow the principal actors and actresses. The general flood-lighting was of such intensity that the "spots" did not give the effect of sharp-edged beams; yet they did raise the illumination on the objects on which they were trained to such a degree as to make them stand out prominently. Pale-blue and amber gelatine color screens were used in front of both the flood-lamps and the searchlamps.

Across the front of the stage proper was run a 2-in. pipe having 0.25-in. holes bored 2 in. apart. Live steam was supplied to this pipe under 15-lb. pressure from a 75-hp. boiler. Just back of the pipe were placed 1000 25-watt lamps in three rows—red, blue and amber, with some clear lamps mixed in. During the change of scenes the steam was turned on and changing colored light was thrown on the stage from the 1000 footlamps. The intensity was varied by means of dimmers, the lamps being controlled in three sections of 50 ft. each. The result was a beautiful steam curtain, rising 30 ft. to 40 ft. in the air and constantly changing color, intensifying and then fading away, suggesting color without form.



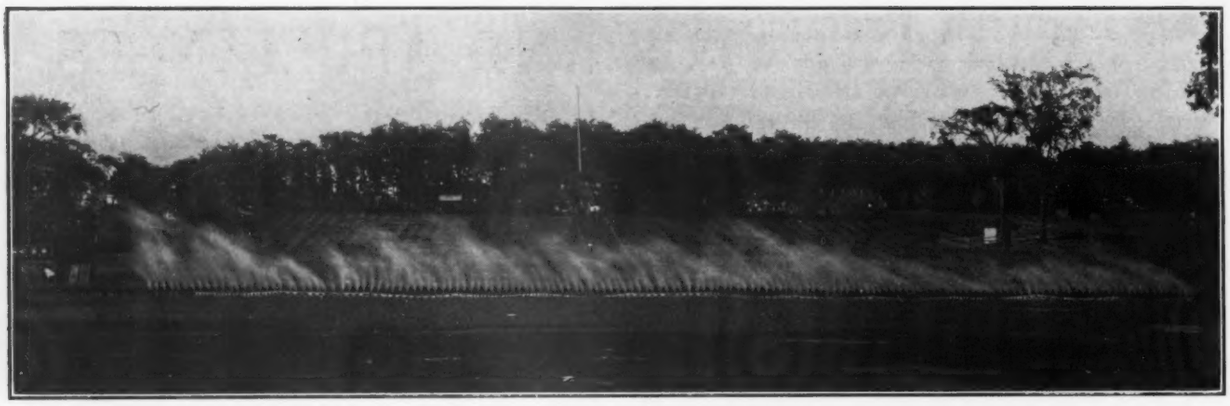
ARRANGEMENT OF STAGE AND PROJECTORS

Not only was the effect exceedingly picturesque, holding the attention of the fascinated audience, but the curtain prevented the spectators seeing the changes of scenery being made behind it. At the same time the steam curtain gave sufficient illumination without the flood-lamps to allow moving the full-sized three-story painted canvas houses and the other scenery off and onto the stage. All of the flood-lamps and searchlamps were also controlled by dimmers. By means of these the light was brought up gradually after the steam was shut off, giving a most pleasing effect.

In wiring the various searchlamps and flood-lamps a balanced 110-220-volt three-wire system was used. The lighting was so arranged that no part of the stage was dependent entirely upon one group of lamps; thus the failure of any circuit would not put any section in darkness. The wisdom of this provision was proved on the second night, after Paul Revere's horse had become frightened at the firing and crashed through the foot-lamps and main feed wires, putting three circuits out of commission.

A twenty-station telephone line connected the operators of the apparatus with the switch house.

THE "STAGE" OF THE PAGEANT OF LEXINGTON, LIGHTED BY FORTY-SEVEN PROJECTORS



DAYLIGHT VIEW OF SPECTATORS' SEATS, SHOWING BATTERIES OF PROJECTOR LAMPS, FOOTLAMPS, AND STEAM CURTAIN JUST STARTING

The following brief summary of the principal materials ordered for this lighting installation may be interesting:

6600 ft. of No. 6 weatherproof wire.
7200 ft. of No. 14 weatherproof wire.
340 ft. of wire netting.
2200 ft. of twin-conductor weatherproof telephone wire.
500 ft. of lamp cord.
Fourteen 60-amp. three-pole, single-throw knife switches.
Two 60-amp. three-pole, double-throw knife switches.
Twenty-five 5-amp. single-pole, single-throw switches.
Twelve push buttons.
Eight 100-amp. dimmers.
Six 25-amp. dimmers.
Sixty 60-amp. cartridge fuses.
200 6-amp. plug fuses.
1000 25-watt lamps.
Twelve 750-watt Edison focus-type tungsten lamps.
Sixty 500-watt Edison focus-type tungsten flood-lighting lamps.
Six 400-watt Edison tungsten lamps.
100 candle lanterns.
300 candles.
Eight 20-in. incandescent searchlamp projectors.
Fifty-six flood-lighting projectors.
Twenty-five orchestra music lamps.
Twenty-five pocket flashlamps.
Twenty-five electric mines (to represent bursting shells).
6 lb. insulating tape.
3 lb. soldering compound.
6 lb. of solder.
150 gelatine color screens.

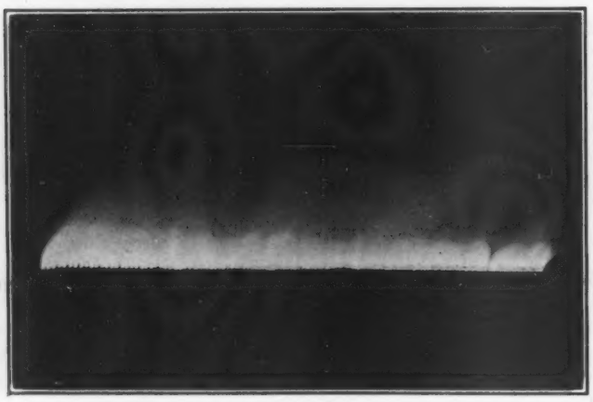
To make up the installation and operate the equipment required the services of fifteen electricians for a week.

The illumination for the Lexington pageant was planned by the engineers of the Edison Lamp Works of the General Electric Company, Harrison, N. J., and was installed under their direction by a corps of Harvard students, Mr. Theodore C. Brown of Harvard supervising this work.

Experience with Gas-Filled Lamps at Brooklyn

In discussing the report of the N. E. L. A. lamp committee at the seventh annual convention of the Brooklyn Company Section held at Coney Island, June 23, Mr. W. H. Grove of the Edison Electric Illuminating Company of Brooklyn reviewed a six months' experience in the substitution of incandescent gas-filled tungsten lamps for arc lamps on city street circuits. On Jan. 26, 1915, the company began the work of substitution by installing eleven lamps. The next replacement, consisting of twenty-seven lamps, was made on Feb. 1, followed by forty-four on Feb. 3. By April 17 the gas-filled lamps installed numbered 3300. For replacing 419 multiple alternating-current arc lamps, 185 300-watt tungsten lamps and 234 400-watt tungsten lamps were used. For 1841 multiple direct-current arc lamps, 185 300-watt and 1656 400-watt tungsten units were substituted. In place of 206 series direct-current arcs, an equal number of 100-cp. 6.6-amp. tungsten lamps were installed.

In effecting these replacements, use was made of the old arc-lamp cases by converting them into containers for the gas-filled tungsten units. During the early stages of the replacement, frequent apparent burnouts caused much annoyance and expense. From Jan. 26 to Feb. 3, there were seventeen burn-outs out of the thirty-eight lamps installed. During a severe storm, in the early part of April, 307 lamps were destroyed in two days. It was finally discovered that much of this trouble was due to a faulty construction of the first 500 arc-lamp cases that had been converted, in that they were not rain-proof. The rain water coming into contact with the heated glass caused the destruction of the lamps. With the containers made rain-proof few failures now occur in stormy weather, as is evidenced by the picture below, taken during a heavy downpour.



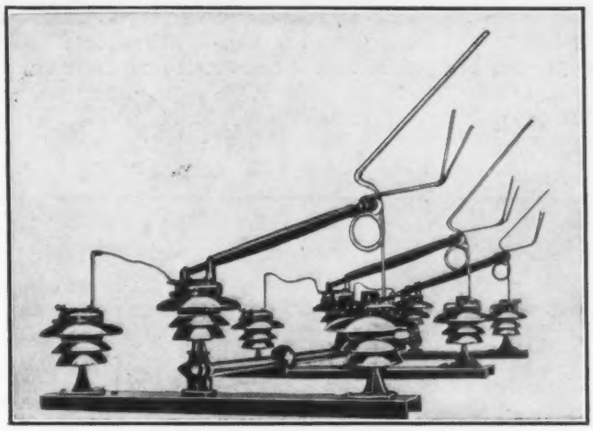
THE ILLUMINATED STEAM CURTAIN AT NIGHT

GAS-FILLED TUNGSTEN STREET LIGHTING IN BROOKLYN

NEW APPARATUS AND APPLIANCES

Outdoor Disconnecting Switch

The final electrical contact on the outdoor disconnecting switch made by the Royal Electric Manufacturing Company of 556 East Fortieth Street, Chicago, is completed by a trolley wheel which engages a heavy spring



35,000-VOLT SWITCH WITHOUT FUSES

horn. The rolling-wedge effect of the trolley wheel gives, it is stated, a smooth make-and-break in operation. The opening of the contact is accelerated by the spring of the contact horn. Heavy arcing horns prevent arcing from the wheel in both the make and the break operations. When thrown to the open position the switch automatically grounds itself so that fuses can be replaced. The fuses are of the S. & C. type.

The force of gravity, in addition to a mechanical lock on the operating lever, tends to hold the switch in either its closed or its open position. The manufacturer claims that the switch offers no surfaces on which sleet and ice can form in sufficient quantities to freeze the switch.

Cable Insulator and Splicing Sleeve

For the protection of cables the Drew Electric & Manufacturing Company of Indianapolis, Ind., has developed a combination insulator and splicing sleeve. In the illustration herewith the parts marked 1 are threaded cast-brass tubes, and those marked 2 are screw-capped openings for filling the joint with insulating compound. The parts labeled 3 are malleable-

SPLICING SLEEVE WITH CABLE PREPARED FOR SPLICE

iron castings which are leaded to the middle section. The central cylinder 4 is a 12-in. glazed porcelain tube with 0.75-in. walls.

Used as an insulator in a cable sheath this device divides the sheath into sections and prevents the unimpeded flow of electrical energy collected from the earth and from underground structures. Used as a splicing sleeve it is said to eliminate leakage at the splice.

To install the sleeve the two bronze end-tubes are taken off of the insulator and slipped over the ends of the cable. The main body of the sleeve is then slipped over one end of the cable. With the splice completed in the usual manner the insulator is drawn over the splice and the bronze tubes are screwed into place. Joints are then wiped at the ends of the bronze tubes and the sleeve is filled with compound.

Fixture with Diffusing Globe and Shade

An indoor lighting fixture which is being marketed by Mr. John D. Raymond, 1601 Fort Dearborn Building, Chicago, Ill., has been designed to provide diffused

FIG. 1—INDOOR LIGHTING FIXTURE WITH DIFFUSING GLOBE

illumination such as is given by semi-indirect units, eliminating at the same time the ceiling shadows cast by the suspension chains of such fixtures. As may be seen from the fixture illustrations herewith, the units consist of hemispherical diffusing bowls and flaring shades of the same material. Fig. 2 illustrates the arrangement which is provided to make the lamp and

FIG. 2—FIXTURE OPEN FOR CLEANING GLASS

the interior of the bowl easily accessible. The filter under the flared shade is ventilated and is adjustable so that the lamp may be raised or lowered to bring the filament to the proper focal center. The fixture is called the "Ramo-light."

Porcelain Socket

In the accompanying illustration is shown a porcelain socket which has been developed by the Arrow Electric Company, Hartford, Conn., for use in bathrooms and other places where moisture exists. The socket is designed to take a G-25 round-bulb tungsten lamp and a husk or glass globe is unnecessary. The socket is provided with a porcelain skirt as shown, which gives it

WHITE PORCELAIN SOCKET FOR ROUND-BULB LAMP

the effect of having a husk. The porcelain is white in color and is glazed. The socket is interchangeable with various types of caps and bases made by the above manufacturer.

Outdoor Lighting Fixture

The Luminous Unit Company of St. Louis, Mo., has recently produced an outdoor lighting fixture which in its two forms may be either suspended from brackets, mast arms and cross spans, or supported on ornamental posts. Being made of heavy vitreous china the reflector and cap of the fixture are proof against the action of the elements or of fumes and gases which the atmosphere may contain. The china is said to be thick enough to resist a heavy blow without breaking. To prevent corrosion, all metal parts of the fixture are made of copper and bronze.

Both types of this unit may be equipped with a partially clear and partially diffusing bowl which incloses the lamp, screening the filament from view and affording mechanical protection for the lamp bulb. Use of this bowl, however, is optional. Two holes in the neck of the fixture under the cap provide ample ventilation.

The unit may be used on either series or multiple circuits. When used on series circuits no part of the socket or receptacle need be removed to replace film cutouts punctured by burned-out lamps. To adapt a unit which has been operating on a multiple circuit to series service, it is only necessary to change the center contact of the socket and to insert a series adapter.

This "Day Way" unit, as it is called, will be found particularly desirable, the manufacturer states, for such outdoor service as street lighting and railroad-yard, train-shed and warehouse illumination.

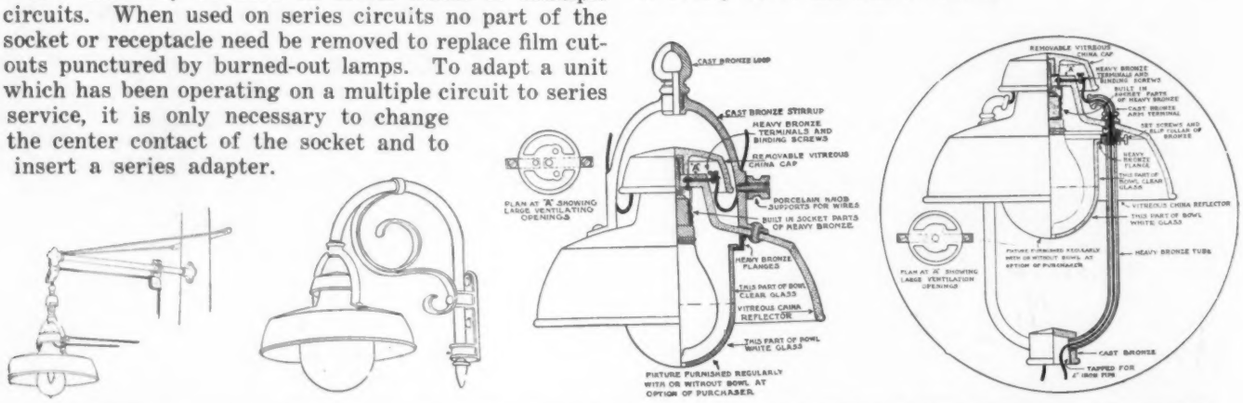
Reflectors for Nitrogen-Lamp Window Lighting

To meet the requirements for show-window lighting which have been brought about by the development of the 100-watt nitrogen-filled lamp, the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill., has placed on the market the reflector shown

CORRUGATED REFLECTOR FOR USE WITH NITROGEN-FILLED LAMPS EMPLOYED IN WINDOW LIGHTING

herewith. The unit is designed to protect the eye from the glare of the filament and to distribute the light evenly over the area to be displayed. Shown herewith is a reflector designated as the "Jove" type and designed for show-window compartments which are from one to one and a half times as high as they are deep, the depth being measured from the front glass to the background.

The company has developed another unit called a "Jupiter" reflector, for use in compartments the height of which is approximately twice as great as the depth. The reflectors are provided with small spiral corrugations for breaking up the light rays and a special backing for withstanding the high temperatures of the gas-filled lamp. With these units, the manufacturer asserts, the light is thrown into the background sufficiently to evenly cover the window trim.


CAST BRONZE LOOP
CAST BRONZE STIRRUP
HEAVY BRONZE TERMINALS AND BINDING SCREWS
REMOVABLE VITREOUS CHINA CAP
PORCELAIN KNOB SUPPORTS FOR WIRES
BUILT IN SOCKET PARTS OF HEAVY BRONZE
HEAVY BRONZE FLANGES
THIS PART OF BOWL CLEAR GLASS
VITREOUS CHINA REFLECTOR
THIS PART OF BOWL WHITE GLASS
PLAN AT A SHOWING LARGE VENTILATING OPENINGS
FIXTURE FURNISHED REGULARLY WITH OR WITHOUT BOWL AT OPTION OF PURCHASER
CAST BRONZE
TAPPED FOR 1/2" IRON PIPE

OUTDOOR LIGHTING FIXTURES WITH CHINA REFLECTOR AND CAP AND METAL PARTS OF BRONZE AND COPPER

Underground-Conduit Exhibit at Panama-Pacific Exposition

Among the interesting and instructive exhibits at the Panama-Pacific Exposition at San Francisco is that of G. M. Gest, who has been closely identified with conduit construction in this country and Canada for the past twenty years. The exhibit occupies about 900 sq. ft. of floor space in the Palace of Machinery and comprises systems of underground conduit and cable construction, maintenance and operation. Various methods of installing underground conduit for "draw-in" systems are shown, including fiber, pump-log, iron-pipe and clay conduit in both single and multiple, square and round-bore types. Trough systems, like those employed in Europe, using cast-iron asphalt and tile, are also exhibited. Of the solid systems the armored-cable (laid directly on the ground) and the Edison tube system are shown. Manholes of brick and concrete construction are represented for telephone, light and power service. A transformer vault is also shown. Apparatus, technically installed, for the proper distribution of electrical energy for the several systems, such as transformers, junction boxes, cut-outs, switches and

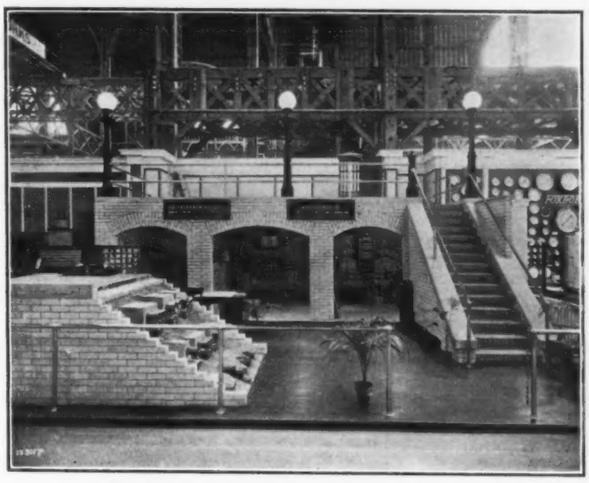


EXHIBIT OF UNDERGROUND CONDUIT SYSTEM

cable terminals, are included in the exhibit. In addition to the cable and other apparatus in the manholes, there are shown a street-pillar and kiosk and an ornamental lighting system with underground feeding system. In recognition of what Mr. Gest has done in developing conduit systems and for his methods of installation, the International Jury of Awards at the Exposition has awarded his American and Canadian organizations a gold medal, the highest award in his class.

99.84-Per-Cent-Pure Iron for Electrical Purposes

The tests of time applied to pure iron have proved beyond question that the rust-resisting characteristics of the pure metal excel those possessed by most commercial irons produced to-day. More recent studies show, moreover, that the properties which in pure iron tend to make it resist rust also tend to better its electrical characteristics. One iron manufacturer, the American Rolling Mill Company of Middletown, Ohio, which under a patented process is making its "American ingot iron" 99.84 per cent pure, has gathered instructive and interesting data showing to what extent purity changes the electrical properties of the metal.

In pure open-hearth or "Armco" iron, as it is called, the manufacturer strives not only to eliminate the five common solid impurities—sulphur, phosphorus, carbon, silicon and manganese—but also to eradicate all occluded gases. How well the former object is accomplished may be seen from comparative data in Table I. The percentages of impurities in the "Armco" iron indicated in this table do not represent the maxi-

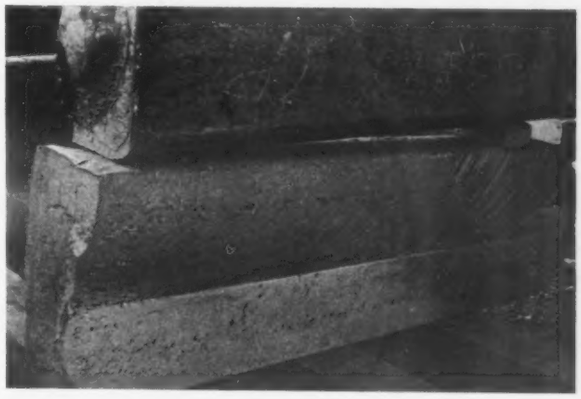


FIG. 1—TYPICAL OPEN-HEARTH INGOT SAWED LENGTHWISE

mum purity attainable, but are the percentages which the company guarantees its product shall equal or excel.

TABLE I—PHYSICAL PROPERTIES OF COMMON IRONS

	Bessemer Steel	Acid Open-Hearth Steel	Basic Open-Hearth Steel	Electric Steel	Old-fashioned Irons	Armco Iron
Silicon.....	0.01	0.02	0.01	0.03	0. 2–0.20	0.002
Sulphur.....	0.05–0.09	0.03–0.05	0.02–0.04	0.01–0.03	0.01–0.05	0.020
Phosphorus..	0.10	0.05–0.09	0.01–0.05	0.01–0.03	0.04–0.25	0.005
Carbon.....	0.08–0.60	0.10–1.00	0.10–1.00	0.10–1.50	0.02–0.05	0.10
Manganese..	0.40–0.70	0.40–0.70	0.40–0.70	0.30–0.60	0.02–0.08	0.020
Copper.....	0.01–0.10	0.01–0.10	0.01–0.10	0.01–0.10	0.01–0.10	0.030

Precautions are taken to eliminate the solid and gaseous impurities at every stage in the manufacture of the iron. The raw material is selected with care. Very little iron ore is used, and the pig iron employed is purchased under rigid specifications. The scrap used must be of high grade. The company pays a bonus to employees who handle this material for all copper and brass sorted from the scrap.

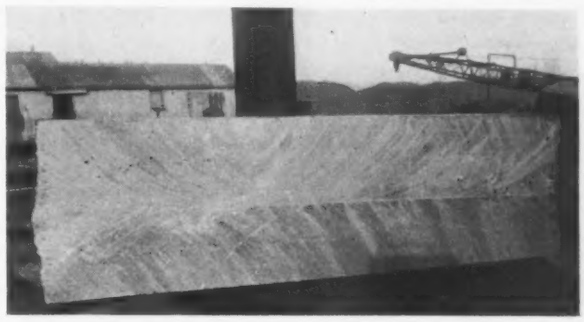


FIG. 2—NORMAL AMERICAN INGOT IRON PRACTICALLY FREE FROM IMPURITIES

Although "Armco" iron is made in basic open-hearth furnaces, the iron is raised to the extraordinary high temperature of 3000 deg. C. and is held in the furnace from 11 to 13 hours, which is several hours longer than ordinary open-hearth product is treated. When the molten metal is tapped from the furnace at this

high temperature, aluminum, a powerful deoxidizing agent, is added in the ladle to degasify the product. The aluminum continues to act while the hot iron is being poured into the ingot molds, and the resulting product is pure iron of low oxygen content and with the evil effects of superoxidation eliminated. Because of its high temperature, the iron remains in its liquid state longer than open-hearth steel, giving the gases a better opportunity to escape. Illustrations of typical American ingot iron and open-hearth steel ingots sawed lengthwise show the difference in the amount of gas held by both products.

TABLE II—CONDUCTIVITIES OF METALS

Copper	99
Aluminum	66
American ingot iron	18*
Open-hearth steel	12

* Electrical Testing Laboratories, New York.

Efforts to eliminate the gas, which is largely carbon monoxide, do not end at the ingot mold, for, as each ingot is brought to the cut-off shear, portions containing gas and other impurities are lopped off. This shearing is much more rigorous in proportion to the impurities shown than that practised in ordinary open-hearth work. In fact, as an ingot is rolled, cut up and sent through the mills, its parts are continually under the eyes of watchful inspectors, who discard any piece showing traces of gas or other defects.

Table II shows the relative conductivity of the metals commonly used for electrical purposes. The table also indicates that for such uses as third-rails, telephone and telegraph wires and high-tension bus-bars, American ingot iron offers about 50 per cent less resistance per unit of volume than open-hearth steel.

Tests conducted on bars of the pure iron show it to possess qualities of high permeability and low residual magnetism. The B-H curve taken from a test of a typical bar indicates that the properties of the iron make it adaptable for use in direct current solenoids, in electric brakes, in electromagnetic instruments, and in the pole pieces of motors and generators.

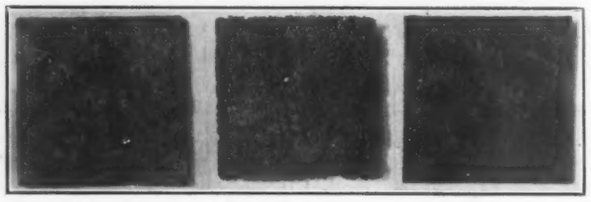


FIG. 3—CHARCOAL IRON, STEEL AND "ARMCO" IRON AFTER THREE-YEAR TEST IN ALKALINE WATER

Because of the absence of occluded gases and impurities in this iron, and because of the high temperatures at which it can be worked without burning, it has been found to be especially suited for making such welded products as transformer tanks and switch boxes. The metal is adaptable for either electric or oxy-acetylene welding. American ingot iron can also be welded successfully to other metals.

Besides possessing desirable electrical characteristics, this pure iron is desirable for such electrical products as transmission towers, anchor rods, outlet boxes and pole-line hardware, because of its rust-resisting properties. A popular opinion exists regarding American ingot iron that it will not rust. If exposed to the weather it will rust, however, but the oxide formed seems to be of a different character from that produced by oxidized open-hearth steel. The oxide of pure iron is finer, adheres more closely to the metal, and seems to cover completely the bright metal, preventing pitting and further rapid rusting. The illustrations herewith of three iron cubes which underwent a three-year test in alkaline water show the protective effects produced by the oxide on the American ingot iron and also show the pitting action which took place on the other irons. The charcoal iron, it will be noted, was corroded uniformly with a loss of 14 oz. per square foot. The steel showed distinct pitting action and a loss of 9 oz. per square foot. The American ingot iron corroded uniformly, sustaining only 7 oz. loss per square foot of surface.

An interesting indication that it is purity of iron which eliminates the electrolytic action between various portions of an exposed surface and creates rust-resisting qualities is shown in the four microphotographs herewith. These pictures show the structure respectively of steel, puddled iron, American ingot iron, and an old-fashioned pure iron taken from a bridge at Newburyport, Mass. The similarity of the structure and analysis of the iron which had stood in the sunshine and moisture on the old New England bridge for a century and that of the 99.84-per-cent-pure commercial iron of to-day is indeed striking.

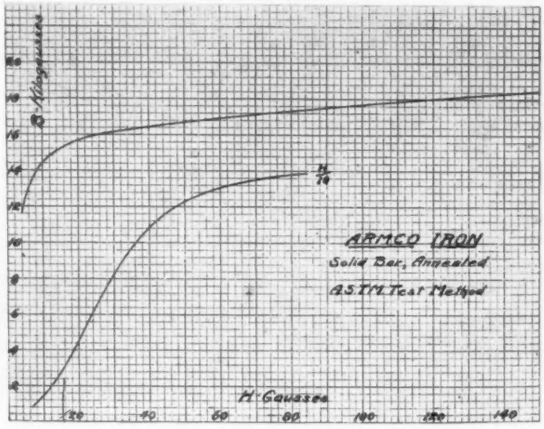


FIG. 5—B-H CURVE SHOWING PERMEABILITY OF AMERICAN INGOT IRON

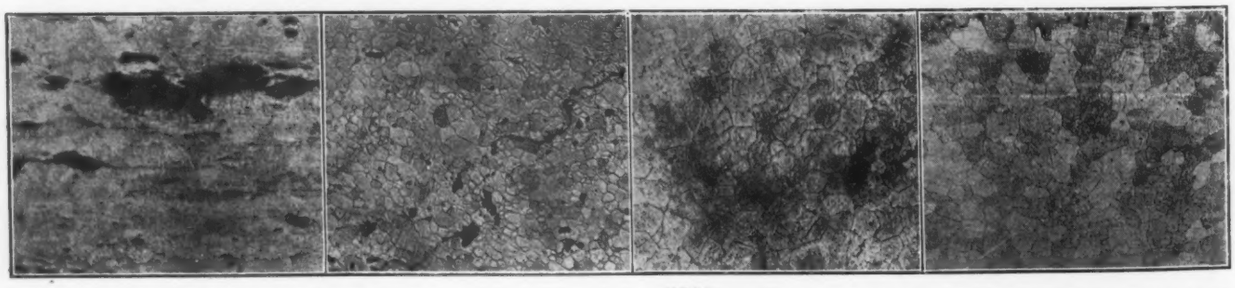


FIG. 4—MICROPHOTOGRAPHS OF NORMAL PUDDLED IRON, ORDINARY MILD STEEL, IRON FROM A BRIDGE AT NEWBURYPORT, MASS., AND NORMAL AMERICAN INGOT IRON

CURRENT NEWS SECTION

ELECTRICAL CONTRACTORS' ASSOCIATION

Convention at San Francisco This Week Reported to Be the Most Successful Ever Held by the Organization

With only four of its twenty-nine directors absent and having the largest treasury balance in the history of the organization, the National Electrical Contractors' Association of the United States held what is reported to have been its most successful convention in San Francisco this week. The special transcontinental train arrived in San Francisco last Sunday, and from that time until the end of the week, when the entertainment features were concluded, general enthusiasm prevailed. Although ex-President Roosevelt and many other distinguished visitors were in San Francisco during the week, their presence did not detract from the general interest in the affairs of the convention.

By far the most instructive and most wholesome open session held by a body wont to meet behind closed doors convened on Wednesday morning. Mr. C. F. Butte, president of the San Francisco association, opened with a very eloquent address of welcome. He was followed by President John R. Galloway of the National Association and by Mr. C. V. Schneider, president of the California Association of Electrical Contractors and Dealers, both of whom spoke very encouragingly of the outlook. In a spirited address Mayor James Rolph, Jr., of San Francisco welcomed the association to the city, spoke of its attractions and especially of the Panama-Pacific International Exposition, and told of the debt which every community owed the electrical contractor. In the absence of Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, who is now on a visit to the Orient, Mr. George A. Holberton, manager of the San Francisco office of the Pacific Gas & Electric Company, delivered an address illustrated by 200 colored stereopticon views on "The Electrical Industry in California." The lecture was similar to that delivered by Mr. Holberton on many occasions, especially before the Association of Edison Illuminating Companies, and was listened to with keen interest by the contractors. Mr. Holberton showed how electricity is generated by the great hydroelectric systems on the Coast and how it is distributed over long transmission lines. He also showed how great and diversified were the uses to which it was put in California, where more electricity is employed per capita than anywhere else in the country. An address was to have been delivered by President C. C. Moore of the Panama-Pacific International Exposition, but, owing to other engagements with high dignitaries of the country who were at that time in San Francisco, President Moore was unable to attend. However, the delegates had by that time seen for themselves the marvelous beauties of the Exposition. Past-president John R. Strong and a director of the Society for Electrical Development, Inc., addressed the meeting in place of Mr. George B. Muldaur on the objects and activities of the Society for Electrical Development. He urged contractors to support it in its work and especially to labor assiduously to make Electrical Prosperity Week a gala occasion and one long to be remembered. Dr. Thomas A. Addison, Pacific Coast manager of the General Electric Company, was out of town and hence could not deliver an address. However, Mr. T. E. Bibbins, San Francisco manager of the company, acted in Dr. Addison's stead, and presented a real message on the text of co-operation. Mr. Bibbins outlined the difference between unfair pooling of interests and the clean competition that is ever alert to help the other fellow for the good of the industry. He told of the opportunities confronting the electrical contractor, and how through enthusiastic co-operation the entire industry can be benefited. After the close of Wednesday morning's session the association voted that it was the most successful and instructive open meeting ever held by it.

Routine business and reports of standing committees were considered at the other sessions during the week. On Monday morning there was an executive meeting of the California Association of Electrical Contractors and Dealers, followed by a regular meeting of the national body in the afternoon. On Tuesday morning the national directors and the executive committee met at the Clift Hotel, and that evening there was a dinner and a regular monthly meeting of the California Association of Electrical Contractors and Dealers at the Clift. The principal speaker of the evening was Mr. W. L. Goodwin, vice-president and general sales manager of the Pacific States Electric Company. Mr. Goodwin spoke on "Co-operation Between Contractors and Jobbers." A business session of the national body was held on Wednesday afternoon, and that evening there was a reception and dance given by the association at the Clift Hotel. Business sessions were also held on Thursday morning and Thursday afternoon, the final business session being held on Friday morning. All of the general sessions were held at the Auditorium at Market, Hayes and Larkin Streets. Thursday night was National Electrical Contractors' Association night at the Exposition.

Many important reports were made during the week. Mr. E. McCleary of Detroit, past-president of the association, member of the executive committee and for many years the representative of the association on all matters pertaining to the National Electrical Code, told of the part played by the contractors' association in formulating the rules incorporated in that document, and said that the association should receive credit for the recent adoption of a single standard for wire and for conduit. Mr. McCleary, who has often expressed a desire to step down from his position and give some of the younger men a chance to get into the active work of the association, intimated that the report would probably be his last, but considering the work that he has done during the last fifteen years, the executive committee and the board of directors, not to mention the membership at large, were loath to have him relinquish the work. In the estimation of President Galloway the association has no one who can do so much for the National Electrical Contractors' Association in the deliberations and actions of the electrical committee of the National Fire Protection Association as Past-president McCleary. Every effort will therefore be made to induce Mr. McCleary to continue his work for a few years longer.

Past-president G. M. Sandborn of Indianapolis made a report on "Universal Data and Sales Book" and also on "Conduit Charts." Mr. J. T. Marron of Rock Island,

Ill., reported on membership and Mr. P. H. Jaehnig of Newark, N. J., made a report on "Legislation, Ordinances and Laws for Electrical Contractors." Mr. Joseph A. Fowler of Memphis, Tenn., as chairman of the committee on labor, reported on "Liability Insurance and Workmen's Compensation." Past-president James R. Strong of New York, made a report on the convention details, and Mr. A. J. Hixon of Boston presented the report of the committee on "Reducing Cost of Electrical Construction." Other reports presented were "Co-operative Protective Committee," "Concentric Wiring," and "N. E. C. A. Bookkeeping System," by Past-president Ernest Freeman of Chicago, and "Publications," by Mr. George E. Sheppard of Wilkes-Barre, Pa.

Electrical Prosperity Week Campaign

The Society for Electrical Development, Inc., has just issued its plan booklet for the Electrical Prosperity Week campaign. For that week, Nov. 29-Dec. 4, the society makes very definite suggestions to central sta-

DESIGN ADOPTED FOR ELECTRICAL PROSPERITY WEEK

tions, electrical manufacturers, electrical jobbers, electrical contractors, electrical dealers, local electrical organizations, non-electrical manufacturers, department stores, non-electrical merhants, public schools, the public, women's clubs, the Electrical Vehicle Association, the International Association of Display Men, the Jovian Order and the National Electric Light Association.

The society, for its part, will undertake to advertise during the week in leading national mediums and will distribute millions of poster stamps, folders, bill posters, street-car cards, window displays and other printed matter. The poster stamps, window lithographs and window cards will be supplied free even to those who are not members of the society, while the larger and more expensive items will be supplied at cost. A special folder addressed to the public will explain the purpose of the week and emphasize what electricity has done for humanity and what it ought to be permitted to do. This will be well written and illustrated and will be distributed to members free and to others at cost. An eight-sheet bill poster lithographed in six colors, with space in the lower panel for a dealer's imprint, will also be furnished free to members and to others at cost. Smaller reproductions of the bill posters may be had in the shape of window lithographs, poster stamps, street-car cards, window cards and electrotypes. The window lithographs, poster stamps, and window cards will be furnished free to all, and the street-car cards will be furnished free to members and to others at cost prices. The same is true of various sizes of electrotypes for use in printing the design on letterheads, envelopes, bills, statements, etc., and for use in newspaper advertising. When members so desire, the advertising staff of the society will render the necessary service in the way of preparing copy for local prosperity week advertising gratis.

Those who have the local work in hand will receive valuable assistance from the society in inaugurating and conducting special features during the week. At present it is planned to issue booklets on "How to Put on an Electrical Parade" and "How to Put on a Demonstration," and similar instructions will be issued covering electric shows, slogan-sign campaigns and co-operative lighting. The society's display service bureau will also issue suggestions to members for making appropriate window displays during the week.

In its propaganda the society calls attention to the necessity for action on the part of the entire industry. It asks for enthusiastic co-operation to the end that there may be a blaze of light extending from coast to coast and from border to border and that the week's experience shall create in the people a desire to live in an electrical atmosphere.

Possibility of Extra Session of Congress and Tariff Revision

A report is in circulation in Washington to the effect that President Wilson will shortly make an announcement of great interest in connection with the tariff. Economists at the capital are now giving much attention to the steps that it will be necessary for the United States to take after the European war has ended. In these plans for the future the question of a protective tariff figures largely. Reports reaching Washington from all over the United States are to the effect that business men will be glad to see a readjustment of tariffs. Business leaders declare that most of the present industrial activity is due to "war orders," and that after the war is ended some return to former dull conditions may be expected if the present tariff is still in force. They further point out that, notwithstanding the enormous sums that have flowed into the United States as a consequence of the war, these sums will again flow out, when Europe recovers, unless there is a protective tariff.

Senators and other tariff makers now in Washington are said to believe that the early fall will furnish a suitable opportunity to discuss these matters and to plan ahead. For that reason there is apparently a growing advocacy of the plan to have Congress reassemble around Oct. 1. This idea obtains support from many Senators and Representatives who are obliged to come to Washington in September to place their children in schools, as well as from those who are anxious to begin as early as possible upon the fight which is sure to come this winter as to whether or not there shall be a great increase in the military preparedness of the United States.

Company Files Appeal from Cincinnati Rate Ordinance

An appeal from the new rate ordinance recently passed by the Cincinnati City Council was filed with the Ohio Public Utilities Commission by the Union Gas & Electric Company on July 13. The new rate ordinance is characterized in the appeal as being unjust and unreasonable. The company has not accepted its terms, the appeal says, but is willing to continue service at the present rates. It asks that the new ordinance be set aside and that the commission, after hearing evidence, fix a rate or price for service, based upon its findings, and order this substituted for the rate named in the ordinance.

Hearings on Valuation of Company Property

The hearing on the tentative valuation of the company's property as fixed by the commission was begun before that body on July 13, the value of the paving done by the company being discussed. There is a difference of $100,000 between the figures of the commission's engineers and those of the company. Mr. W. J. Norton acted for the company in cross-examining the witnesses. Mr. Norton said at the outset that there would be a difference in the labor estimates, explaining that the company had used actual data found by experience, while the commission's engineers had employed theoretical cost data.

Mr. Paul Bird testified concerning the values of the company's West End real estate, of which 80 per cent is used for electrical purposes. There are wide discrepancies between the estimates of the value of these properties made by the company and by the commission, and between the actual cost and the figures used by the commission. Mr. Walter M. Schoenle, city solicitor, endeavored to show that the value of the properties has decreased, but Mr. Bird contended that this is a mistake. Mr. Charles R. Mackey, superintendent of the company, spoke of the adaptability of the properties to the purposes of the company and quoted prices of properties recently sold in those localities which are as high or higher than those listed by the company's appraisers.

Discrepancies in Cost Figures Submitted

Mr. Bird also testified concerning the prices of materials used in construction work, wherein very wide differences were shown. For instance, concrete work listed by the company at $6.50 per cubic foot was placed at $4.64 by the commission's engineers. Cut-stone work estimated at $1.75 per cubic foot by the commission was set at $6.50 on the company's schedule. Excavating figured at 75 cents per cubic yard by the commission's engineers was listed at $1.50 by the company's representatives. The discussion also developed the fact that there is a wide difference in the valuation of the company's substations.

Mr. H. L. Nichols testified on the cost of labor and materials in the construction of the distribution system. The commission's figures, he said, are much lower than the company's because of the obvious omissions made by the engineers in summarizing.

Cost of Copper Discussed at Second Day's Hearing

On July 14 the hearing was resumed with Mr. Nichols on the stand. He said the difference in the appraisals of the company and the commission on the distribution system is $257,000. The commission's engineers figured labor and installation at $418,756, while the company placed the same items at $528,038. In getting at the price of copper wire the commission took a three-year average, while the company used a ten-year average. Mr. Nichols said that the ten-year average shows a price between 14 cents and 15 cents per pound, while the price now is 20 cents per pound.

An adjournment was taken until Aug. 3 to allow the engineers representing the commission, the company and the city to come together and to check over the items which the company claims the commission's engineers omitted from their tabulation.

In filing an appeal on the new rate ordinance, it is said that the company's attorneys will take advantage of an apparent conflict between the provisions of the Crosser referendum act and the Langdon public utilities bill. The latter, which became a law after the Crosser act, provides that the company or 3 per cent of the electors of a municipality may appeal a rate ordinance to the Public Utilities Commission. In this way it supersedes the provisions of the referendum law. The People's Power League and other radical organizations in Cincinnati are preparing petitions for a referendum vote on the ordinance, claiming that the rate is too high. However, if the attorneys are correct in their interpretation of these laws, it is possible that the whole matter will be left to the commission for decision and that this will be final unless appealed to the courts.

Foreign Hydroelectric Reports

The New York office of the Bureau of Foreign and Domestic Commerce has a series of special reports made by United States consular officials in regard to hydroelectric development in foreign countries. The bureau believes that the reports are of special interest to those who are interested in hydroelectric enterprises and to manufacturers of equipment for such properties and has therefore opened them for inspection. The reports have been at the Chicago branch office of the bureau, and will be sent later to Boston and from there to other branch offices.

An Electric Banquet Cooked for Two-Thirds of a Cent per Plate

Sixty-five persons were present at the "electric supper" given by the Great Western Power Company at San Francisco, July 2, when the entire repast was

ELECTRIC BANQUET GIVEN BY THE GREAT WESTERN POWER COMPANY

cooked on two Simplex electric ranges with an energy consumption of 14 kw.-hr. At 3 cents per kilowatt-hour the total cost of energy was therefore 42 cents, or a little less than 6.5 mills per person. Mr. Wallace Briggs acted as toastmaster and called for speeches from Mr. Mortimer Fleishhacker, president of the power company; Mr. F. C. Czarnecki, San Francisco; Mr. S. E.

Gamble, Petaluma; Mr. F. H. Woodward, Oakland, and Messrs. C. E. Mynard, Adolph Mobio and E. A. Wilcox, all of San Francisco. Carrying out a suggestion made by Toastmaster Briggs, a banner will be awarded to the power company's sales district making the best showing in the development of local electrical cooking business during the next three months.

Federal Trade Commission Affairs

Mr. Warren R. Choate, chief clerk of the Federal Trade Commission, has been deputized as executive officer of the commission during the absence of its members in the West, and is conducting the Washington office, whose routine continues in the hands of examiners, counselors and investigators, exactly as if the members were in Washington.

Before leaving for the tour, a member of the commission said in Washington that it is possible that the electrical interests will be heard by the commission later on, as the lumber interests are being heard, for the purpose of ascertaining what will be necessary in the way of a change in the laws of the United States to permit the electrical industries to engage in export combinations, if they desire so to do.

It is understood that some members of the electrical industries have been heard along these lines already by some members of the commission, although members of the commission withheld their names.

Meeting of Executive Committee of N. E. L. A. Commercial Section

The executive committee of the Commercial Section of the National Electric Light Association held its first meeting since the San Francisco convention at the headquarters in New York on July 19. The following were present: Messrs. J. F. Becker, chairman; Douglass Burnett, E. A. Edkins, F. H. Gale, H. N. McConnell, J. C. McQuiston, C. J. Russell, George Weiderman, R. R. Young, and C. A. Littlefield, secretary, and Miss Burkhalter, assistant secretary. Messrs. R. S. Hale, L. R. Wallis and M. A. Oberlander, representing Mr. E. W. Rockafellow, attended by invitation.

A letter from President Lloyd suggesting that some members of the Accounting Section might serve on one of the commercial committees was read by the secretary.

Chairman Becker asked Past-chairman Burnett to make some suggestions for the year's work. Mr. Burnett suggested the appointment of a committee to handle the hydroelectric situation in the South, calling attention to the proposed association of hydroelectric sales managers which the section would like to have organized as a committee of the section.

Mr. Burnett reported that the National Commercial Gas Association has voted to call its present handbook the "Salesmen's Catalog" and to issue data on installations, etc., to conform with the N. E. L. A. Commercial Section handbook. The new book will be called the "Salesmen's Handbook." Mr. Burnett suggested that Mr. Russell be requested to communicate with Mr. Rushmore with the object of inducing the American Institute of Electrical Engineers to issue its sheets in the same form, thus effecting standardization of practically all the data books of the industry. Mr. Burnett reported that Mr. Martin Rice of the General Electric Company had assured him at San Francisco that the company would be very glad to co-operate in any way in the issuance of the section publications. It was also suggested by Mr. Burnett that the members of the section be asked to give suggestions regarding additional information which they would like to have covered in the handbook, or ideas as to improvements in the book, to which Mr. Russell replied that a return card is to be sent with the next issue asking for this information.

There was some discussion as to the personnel of the different committees to be appointed to carry on the work of the section during the coming year. In the discussion of the membership committee it was suggested that the chairman appoint state chairmen from the various states to act in the interest of the section in their locality. Mr. Burnett suggested that it would be well to have a member of the committee from each of the company sections to increase the membership and to promote the discussion of commercial subjects in the company section meetings. In connection with the publication committee Mr. Young suggested that it would be well to have a rather large number of members even if they could not attend all of the meetings, as they could act as publicity men in the sale of publications.

The secretary read a letter from Mr. Jenkins reporting that already many applications for the education course have been received. Letters have also been received from several member companies stating that classes are being organized. This will mean a number of additional applications. It is planned to start the course on Oct. 1. Mr. Edkins spoke of a course for "power" salesmen proposed by the power sales bureau, and Mr. Russell said that there would certainly be no conflict. It was suggested by Mr. Hale that the title of the committee on wiring of existing buildings be changed to committee on wiring, and that the work next year be directed to secure better methods, not cheaper quality.

A letter was read by the secretary from President Lloyd quoting a communication from Mr. W. H. Atkins of the Edison Electric Illuminating Company of Boston. Mr. Atkins suggested that the efforts of everyone this year be devoted to commercialism and commercial engineering and that the engineers confine their efforts toward commercial work, with the idea of bringing to the support of the commercial side of the industry the engineers who have made possible the wonderful engineering successes. All the members of the committee expressed hearty approval of the suggestion and a resolution was passed indorsing the sentiments contained in the letter from Mr. Atkins and stating that Chairman Becker, Past-chairman Burnett, Vice-chairman Edkins and Mr. L. R. Wallis stand ready as a committee of four to take whatever action may be agreeable to the main executive committee to carry out these plans.

Mr. Russell reported that the power sales bureau has seventeen main committees and nineteen sub-committees and that it is collecting data so that inquiries for information along the lines of motor service may receive immediate attention. It was decided that this material should be kept on file at the Commercial Section office and distributed from there. The committee on terminology will be discontinued. A committee on the question of credit was suggested. Chairman Becker said that while only the standing committees would be appointed at this time, additional committees would probably be formed later on when this question could be raised again.

Mr. Gale referred to the plans for "Electrical Prosperity Week," which are being promoted by the Society for Electrical Development. It was voted to recommend to the Commercial Section members that they participate actively in the plans for this week.

Subject to change at the discretion of the chairman, it was decided to hold the next meeting of the committee on Oct. 11 at the headquarters in New York.

OHIO CONVENTION AT CEDAR POINT

Relations with the Public, Experience with Gas-Filled Lamps, and High-Tension Insulators Among Topics Discussed

Nearly duplicating last year's high-water mark of 400 persons in attendance, the 1915 convention of the Ohio Electric Light Association, held at Cedar Point, Ohio, from Tuesday to Friday of this week, was in point of interest and varied character of discussion one of the best ever arranged by the central-station men of the Buckeye State. Although no manufacturers' exhibits were displayed this year, several highly interesting demonstrations of electrical apparatus were presented before the convention body.

In his presidential address, which opened the regular program on Tuesday, Col. C. V. Hard of Wooster traced the history of the Ohio association from its founding in 1895 and reviewed in detail the excellent work done by the association committees during the last year. The book of rules and principles for the appraisal of utility properties, prepared by a joint committee under Order No. 176 of the Ohio Utilities Commission, was commended by Mr. Hard for adoption by the association.

President Hard on Relations with the Public

"Of all the problems confronting the lighting companies at this moment," said the president, "those which involve the relations of the utility companies and the public are the most important. They are really vital, and upon their wise solution depends the future of the companies.

"While the policy of public ownership of utilities bids fair never to be generally adopted because it is against the public interest, the public regulation or control, which is the alternative principle, is evidently the solution of the problem. And in arriving at just rules of control the utilities must frankly meet the public, whose servants we are, with the best service at the most reasonable rates consistent with fair returns to capital.

"There should be no quarrel between the company and the public. The people do not always understand all that is involved in the utility company's business, and some of them get exaggerated ideas of the profits it is enabled to earn, and it is these who make the violent 'kicks,' chiefly because they don't understand. The great majority of people are willing to pay a fair price for good service, and the chief thing they want to know is that they are paying a fair price.

"Our aim must be to convince the public that they are getting fair treatment, and then see to it that they do get fair treatment.

"In conclusion let me suggest that the most valuable asset a public utility can possess is a well-founded reputation for courtesy and liberal treatment of the public, good service and fair rates. Without these, if I may paraphrase the language of a great American, you cannot succeed, and with them you cannot fail."

Report of Secretary Gaskill

The report of the secretary-treasurer, Mr. D. L. Gaskill, Greenville, Ohio, was of more than usual interest this year as it reviewed the results of the work of the association's new legal department. During the first half of 1915 this department succeeded, with the cooperation of members of the association, in demonstrating the unfairness of proposed State legislation adverse to the public utility companies.

The secretary-treasurer's report also showed the association to be on a sound financial basis for the first time in several years. Mr. Gaskill commended particularly the work of the appraisal and accounting committee under the chairmanship of Mr. Robert Lindsay of Cleveland.

Report of Committee on Illumination

The committee on illumination, of which Mr. S. E. Doane of Cleveland was chairman, having kept members advised of lamp developments through a series of monthly letters, did not present a formal paper but invited discussion of lamp-operating by central-station delegates present.

Discussion on the illumination committee's report dealt chiefly with the problems of operation of gas-filled tungsten lamps. Mr. O. H. Hutchings questioned whether sufficient attention had been given to maintaining the light center in the new lamps at precisely the same location it occupied in the old lamps. Mr. S. E. Doane of Cleveland assured the questioner, however, that it had been maintained as near as could be. In answer to another question, Mr. Doane stated that the lamp manufacturers did not recommend operating gas-filled tungsten lamps in series with direct-current or with magnetite-arc lamps. Successful operation of lamps on mixed circuits is possible, said he, on alternating-current circuits.

Standardization of Operating Voltages

In its report the committee on standardization of voltages explained that in attempting to concentrate on some standard pressure other than the one used locally, a central station need expect little difficulty if its operating potential is raised a few volts or, under some conditions, even as much as 10 volts. It is generally understood that the wide range found in central-station lighting voltages at present is due to the former inability of the incandescent-lamp manufacturers to produce lamps accurately of any single certain voltage. Different central stations, therefore, in order to utilize the manufacturers' product to the best advantage, adopted odd voltages. Without doubt, however, declared the committee, the adoption of odd voltages to facilitate lamp production has been a disadvantage to other branches of the industry. But now since the lamp manufacturers are able to make lamps of any predetermined voltage and since lamp production could be made less expensive if the commercial demand was for lamps of only a few voltages instead of many widely different ratings, the committee recommended that Ohio central stations bring their lighting voltages within the range of 110 to 120 volts, and within this range concentrate entirely upon the three centers, 110, 115 and 120 volts. The co-operation of the entire industry was asked in making this change general throughout the country.

With almost no discussion, the report of this committee was accepted. In reply to a question Mr. Doane explained that the committee had consulted the manufacturers of other electrical equipment than lamps, and in general no opposition to the standardization was encountered.

Every-Day Problems of the Central-Station Manager

By far the most thoroughly discussed topic during the first two days of the convention was that which was to have been the subject of a paper by Mr. E. J. Bechtel of New York City, namely, "Every-Day Problems Confronting the Central-Station Manager."

Mr. D. L. Gaskill of Greenville declared that the question of public policy is foremost among the manager's problems. He pointed out the difference in the public-policy problems of the small-plant man who knows all his customers personally and can settle difficulties himself, calling in person on the complainant, and the large company, the manager of which does not know and can seldom be acquainted with even 1 per cent of his patrons.

Mr. Weare Parsons of Springfield discussed the manager's organization problems and recommended that all

managers watch the trend of the plant load-factor and direct the efforts of their new-business departments so that the load-factor will be increased. He cited summer operation of combination steam-heating isolated plants as an example.

Mr. W. R. Power declared that the manager in disguise can learn more in his own office in three minutes than in three days at his desk.

Transmission and Distribution

Mr. M. H. Wagner of Dayton, as chairman of the committee on transmission and distribution of electrical energy, included several recommendations in the committee's annual report. Chief among these was the suggestion that central-station men exercise greater care in handling high-tension insulators. Precautions are necessary mainly to avoid nicking and to prevent cracking due to freezing following an accumulation of water in the sections and pinholes of the insulators during cold weather. The committee also recommended that insulators be omitted from guy wires holding line structures carrying circuits operating at 5000 volts or higher. Anchors to which such uninsulated guys are attached should be grounded. The committee also favored two-circuit transmission-line construction, and advised that such lines be equipped with electrolytic lightning arresters near the apparatus to be protected and be, moreover, provided with a continuous ground wire.

As the result of a series of tests on twelve types of ground connections the committee also advised that distribution systems be grounded to water systems whenever possible, and that two, and preferably more, artificial ground connections should be used on secondary distribution systems if it is impossible to secure a connection to the water system.

Mr. E. E. F. Creighton, Schenectady, N. Y., followed with a demonstration of high-frequency insulator tests, and the Cronin Electric Company presented an exhibition of changing insulators on a "hot" high-tension transmission line.

"Snuggling Up to John Smith"

"John Smith" was the name assigned to public sentiment in the interesting paper read by Mr. E. B. Fenton, manager of the publicity department of W. S. Barstow & Company, New York City. Under the title of "Snuggling Up to John Smith," Mr. Fenton outlined goodwill advertising policies that have been successfully used by companies which through poor management had incurred public disfavor.

It is because the distinction between the individual and the mass has not been clearly understood, said Mr. Fenton, that many executives have been amazed to find their companies unpopular when they as individuals get along nicely with the individuals of the community. Because this distinction exists, there is need for two broad lines of central-station advertising—(1) commercial advertising, or advertising to sell appliances and service, and (2) good-will advertising, or advertising by which the company may acquire the friendly interest of the community. The publicity department which prepares this advertising should be maintained, concluded Mr. Fenton, on an equal basis with the operating, engineering, treasury and all other company departments.

Report of New Business and Other Committees

In the report of the committee on new-business cooperation, Mr. T. F. Kelly of Dayton, its chairman, reviewed the programs of the five meetings which the committee has held during the last twelve months. The suggestion was made that the 1915-16 midyear meetings of the meter, transmission and new-business committees be held on successive days in Sandusky, Middletown, Akron, Springfield and Newark during the year.

The report of the meter committee, of which Mr. A. H. Bryant of Cleveland was chairman, was confined to reviews of papers presented at the committee's midyear meetings. Rules and regulations governing watt-hour meters were also suggested. The suggested rules follow in general those laid down by the utility commissions of New Jersey, New York, Pennsylvania and Wisconsin.

Foreign Trade Developments in Washington

A meeting has been held in Washington by the committee on statistics and standards of the Chamber of Commerce of the United States and members of the Bureau of Foreign and Domestic Commerce of the Department of Commerce to discuss the alteration of the public reports of export and import statistics, so that such figures shall be of more direct benefit to business men. A concerted effort will be made to clarify reports and eliminate unimportant matter.

Several commercial organizations are assisting government officials to form what are termed "voluntary deputy branches" of the Bureau of Foreign and Domestic Commerce. The effort is to get "trade opportunity" information into the hands of those who can make valuable business use of it with the least possible delay. Some of this information comes by cable from consuls and diplomatic officers abroad. In addition to the eight branch offices established recently at important centers by the Bureau of Foreign and Domestic Commerce, it is now understood that additional offices are to be opened at Dallas, Tex.; Kansas City, Mo.; Portland, Ore.; St. Paul, Minn.; Memphis, Tenn.; Detroit, Mich., and Philadelphia, Pa.

Mr. Maurice Damour, special commissioner of the French government now in the United States and secretary of the committee of French Deputies visiting here, believes that the war will be followed by closer commercial intercourse between the United States and France. Heretofore France, he declares, has spent $160,000,000 a year in Germany for machinery. He says that there is no reason why France should not spend that much and more in the United States after the war is over.

New Canal Zone Wireless Station First Link in Communications with Philippines

The radio station at Arlington, Va., just across from Washington, D. C., is now working with the new high-powered station at Darien, Canal Zone, and it is reported that all government messages between the capital and the Canal Zone will in the future be transmitted between these two stations.

The Darien station, which has just been put into operation, has three masts 900 ft. apart, each mast being 600 ft. high. The Arlington station has two masts 450 ft. high each and one mast 600 ft. high. The Darien equipment is of the 100-kw. continuous-oscillation type of apparatus. The station is situated at the edge of Gatun Lake, on three little island knolls, and the foundations and lower part of the works were constructed before the water was let into the lakes, a good electrical "ground" being thus obtained. Comfortable quarters for the crew of twenty men have been erected near the station, twenty men being detailed there, in charge of Lieut. R. S. Crenshaw, under whose supervision the station was built.

The Darien office is working also with the two small stations on the Isthmus, one at Colon and one at Balboa, and when the high-powered station now being built at Hawaii is completed Darien will work with that office, Hawaii in turn communicating with the Philippines.

Miscellaneous News Notes

Hodenpyl-Hardy Sales Managers to Meet at Grand Rapids, Mich.—The heads of commercial departments of the utility properties operated by Hodenpyl, Hardy & Company, New York City, will meet at Grand Rapids, Mich., Monday, July 26, for the discussion of commercial and sales problems. The sessions will be held at the offices of the Grand Rapids-Muskegon Power Company, Grand Rapids.

Portable Electric Plants for Army "Movie" Shows.—The 1915 equipment required by chaplains of the United States Army for the entertainment of the regular soldiers when in camp is now being distributed throughout the army. Included in this equipment are portable electric-lighting plants for the operation of moving-picture machines and the illumination of assembly tents when the men are in camp.

Inspection Trip of City Officials of Harrisburg, Pa.—As a result of a recent inspection trip to Baltimore, Md., the City Commissioners of Harrisburg, Pa., are advocating the substitution of single light standards for all swinging arc lamps, and the removal of overhead electric wires and cables to underground conduits. Accompanying the Commissioners on their inspection trip were several representatives of the Harrisburg Light & Power Company.

Lowell (Mass.) Electric-Light Company in New Home.—The Lowell Electric Light Corporation has just moved into attractive new offices on Market Street, Lowell, Mass. A reception was held from 2 to 5 p. m. on the opening day, July 14, when an orchestra of seven pieces gave a varied program. The company occupies the first two floors and basement of the building, the front of which is painted "Merrimack green" to accord with the local "white-way" color scheme.

Artesian Well Operates a Waterwheel and Generator.—The pressure afforded by an artesian well in Australia has been utilized to operate the waterwheels of a small hydroelectric plant. The apparatus consists of two Leffel waterwheels operating on 190-lb. pressure and driving two 10-kw. direct-current generators which feed a two-wire distributing system. The energy is supplied at 220 volts to twenty-five consumers using a total of eighty 50-cp. metallic-filament lamps.

Electric Ice-Making Reduces Cost to Consumer.—The ice plant of the Springfield (Ohio) Coal & Ice Company is now operated electrically from the lines of the Springfield Light, Heat & Power Company, and as a result of the economies which have been instituted through the substitution of electric for steam drive the company has just announced to householders a cut in the price of its frozen commodity from 40 cents to 25 cents per 100 lb. The daily output of the ice plant has also been considerably increased.

"To Baltimore, the Electric City."—For the convenience of motorists and as an advertisement for Baltimore, the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., has placed a number of route markers along the roads leading to the city, each marker bearing the legend "To Baltimore, the Electric City," together with the name of the large city to which the road leads in the other direction. The signs are in Oriole colors, yellow and black. Nearly 550 of these markers have been placed.

Statistics on Financing of Utilities in Great Britain.—During the six months from January to June of each of the last five years, capital for electric utilities was subscribed for in Great Britain as follows: Electric light and power—1911, $12,398,309; 1912, $23,419,321; 1913, $12,180,986; 1914, $20,386,484; 1915, $2,661,732. Telegraph and telephones—1911, $2,588,584; 1912, $12,725,751; 1913, $2,880,968; 1914, $1,187,426; 1915, figures not available. Electric railways—1911, $14,814,419; 1912, $32,261,158; 1913, $17,490,201; 1914, $18,521,101; 1915, $2,102,328.

Making the Electric Fan "Sella da Banan'."—A fruit dealer at Hamilton, Ohio, points out the triple service rendered by one of his electric fans which is installed over his display of fresh fruit. First, it circulates and cools the air over the fruit and so prevents premature rotting because of exposure. Second, by having streamers fastened here and there over the fruit, the fan keeps these in motion, "shooing" away flies. Third, the breezes from the fan waft the aroma of the fruit up and down the street so that, according to the merchant, "a demand is created for the fruit before the people really get to the stand."

Holyoke Wiring Plan Rejected.—The Holyoke (Mass.) Board of Aldermen has rejected the petition of the Holyoke Street Railway for authority to run a lighting circuit from Easthampton to Mountain Park. John J. Kirkpatrick, manager of the municipal lighting plant, opposed the petition on the ground that it would lead to the introduction of power service at the expense of the city station's business. It is expected that the company will appeal to the Massachusetts Gas and Electric Light Commission to set aside the finding of the local board.

Wireless Control of New Air Torpedo.—An aerial torpedo which can be launched from a Zeppelin dirigible, controlled by radio-telegraphic impulses at a distance of two miles, and finally made to dive to earth with its destructive load of high-power explosive when over the locality to be attacked, is described by a Dutch war correspondent as being now in course of development by the German aerial corps. The new air torpedo is said to be of the heavier-than-air type and to depend upon the power of its propellers for its ability to remain in the air.

Youngstown Plans "White-Way" Celebration.—The merchants and business men of Youngstown, Ohio, have fixed Aug. 18 as the date for celebrating the inauguration of Youngstown's new "white-way" lighting system, which will be completed a few days in advance, according to Mr. E. H. Bell, local manager. The original contract called for 316 lamps, but recent additions have increased the number, and it is now probable that 500 lamps will be ready for use at the celebration. In addition 1000 new lamps in the residence districts are already in operation, and many more will have been placed before the date set for the "white-way" celebration.

Chicago's Proposed Meter Ordinance.—In endeavoring to draft an ordinance providing for the test, inspection, sealing and adjustment of electricity meters by the city's department of public service, the committee on oil, gas and electricity of the Chicago City Council has put aside an ordinance prepared by the engineers of the department of public service and has substituted therefor a draft submitted by the corporation counsel. The proposed ordinance as it now stands does not provide for the making of periodic tests nor do its stipulations for accuracy coincide with those set forth in the service rules issued by the State Public Utilities Commission of Illinois. The measure does provide, however, for making complaint and installation tests.

Setting and Sighting Pole in Thirty-eight Seconds.—In the pole-setting contest held during the recent field day of the Boston Edison company, as noted in these columns July 10, the winning team erected and plumbed its pole in 38.6 seconds. The holes were all dug in advance, and each crew started with its pole already butted and lying on the ground. The poles were Class B chestnut timbers, having girth dimensions of 39 in., measured 6 ft. from the butt end, and 28 in., measured 6 ft. from the top. The use of a dinky was optional under the terms of the contest. The purpose of the contest, which, as previously stated, was won by the Waltham crew in 38.6 seconds with "perfect alignment," was to set the pole in the hole, sight it, and secure it with pike poles ready for back-filling.

Delays to American Commerce at Sea.—Visitors to Washington in intimate relation to governmental activities have gained the impression that very little if anything can be done by the government toward ending the many and long delays and the heavy expense under which exporters of all classes of material to belligerent as well as neutral countries are laboring. It is stated in Washington that there have been 2000 instances of delays to shipments since the war began which have been the subject of complaint to the State Department, and that these delays have represented an expense of millions of dollars. As a result of this exporting situation, a proposal has been made for a general conference in Washington in the near future, to be attended by representatives of all the large business interests of the country.

"Alive?" "Dead?" "Well, It Was a Wire, Anyway!"—Not very long ago a prominent Cleveland citizen went to the local electric-light company's office and declared that one of the latter's wires had killed a favorite tree on his grounds. "That tree has been standing there for twenty years," said he, "and we regard it as one of the family. My children played under it when they were babies. When it began to die we mourned as for a near and dear relative. We couldn't see what ailed it until yesterday, and then I saw that a wire was lying across one of its branches. That tree has been electrocuted—and I feel as if a murder had been done." Considerably moved, a representative of the company went to the scene and found the tree still living, although somewhat injured. When he traced the wire, he found that one end was nailed to an old cross-arm and the other end attached to a discarded pole. The wire had been disconnected and forgotten for two years or more. Following is the laconic report turned in by the inspector: "Tree alive. Wire dead. Wire evidently killed by tree. What shall we charge?"

Linking Springfield, Ill., with Neighboring Communities.—So many applications for electric service have been received from residents of Rochester, Ill., a little town made up for the most part of retired farmers, and from scores of farm owners along the seven-mile transmission line connecting Rochester with Springfield, the state capital, that the Springfield Gas & Electric Company has been unable to meet the demand for installations. More than a thousand farmers, townspeople and residents of Springfield participated in a real old-fashioned jubilee at Rochester, July 9, when for the first time twenty-five 250-cp. nitrogen-filled tungsten street lamps were switched on. A score of residences in Rochester had also been wired and all were turned on at once. Within four days from the time the 6600-volt transmission line was completed into Rochester twenty-two residences had been connected for service. There are nearly 200 houses in the hustling little city, and Mr. A. D. Mackie, vice-president of the Springfield company, expects that at least half of these buildings will shortly be using electric service. One farmer, residing half-way between Springfield and Rochester, paid half of the expense of installing a transformer on the line so that he could connect up his house and farm buildings.

Associations and Societies

Dinner-Dance of Louisville Jovians.—Nearly 150 people attended the dinner-dance given by Louisville Jovians on the evening of July 16 at Sennings Park, a popular resort just south of the Falls City.

Chicago Electric Club-Jovian League Outing.—The annual picnic and outing of the Electric Club-Jovian League of Chicago will be held at Ravinia Park, Chicago, Aug. 5. Mr. H. A. Mott is general chairman and Mr. Fred M. Rosseland is secretary of the special committee for the day.

Young Men's Electrical Association at New Bedford, Mass.—Electrical students of the New Bedford (Mass.) Industrial School have formed the Young Men's Electrical Association for the purpose of visiting power plants and places of electrical interest in New Bedford and vicinity.

Dayton Electric League.—A new electrical organization has been formed at Dayton, Ohio, under the name of the Electric League, and has an initial membership of fifteen. The purpose of the organization is to bring into its membership the leading electrical men of the city. The first meeting was held at a handsome bungalow which has been donated by one of the members of the league for the use of members. All of the members are Jovians.

Outing of Cincinnati Section, N. E. L. A.—The annual outing of the employees of the Union Gas & Electric Company of Cincinnati will be held at Highland Grove Park, near that city on July 24. This year the employees of the Kentucky properties owned by the same interests will share in the picnic, which is held under the auspices of the local company section of the N. E. L. A. Mr. F. R. Healey is chairman of arrangements, and Mr. W. A. Wadsworth is secretary of the special committee.

Iowa Section, N. E. L. A., Changes Meeting Place.—Although the Iowa Section of the National Electric Light Association at its recent convention voted to hold its 1916 convention at Ames, Iowa, the matter has since been reconsidered, and it has now been decided that the next meeting will be held during April, 1916, at Dubuque. The Iowa District Gas Association and the Iowa Street & Interurban Railway Association will probably hold their conventions in Dubuque at about the same time.

Students' Contest Held by Pennsylvania Engineers' Society.—The results of the electrical-engineering competition held by the Engineers' Society of Western Pennsylvania, Pittsburgh, Pa., indicate that the Carnegie Institute of Technology, Pittsburgh, carried the greatest share of honors. The first prize was awarded to Mr. Henry Levy of Pittsburgh, the second to Mr. L. K. Wildberg of Pittsburgh, and the third to Mr. H. E. Gumbert of Macon, Ill. All of the winners are from the Carnegie school.

A Grievance Committee to Adjust Contractors' Inspection Difficulties.—In an effort to adjust differences of opinion which develop from time to time between local electrical contractors and inspectors, the Louisville Electrical Clearing House, an organization of the contracting electrical concerns of the city, has provided for the appointment of a grievance committee to which such questions will be referred and which will seek to find an answer agreeable to both parties in the controversy. The appointment of this committee of five has been intrusted to Mr. C. C. Childers, president of the organization. It is expected that the new committee's duties later on will be extended to include the matter of taking up and disposing of other differences affecting local members of the organization.

Electrical Instructors at University of Pittsburgh.—The University of Pittsburgh, Pittsburgh, Pa., entertained twenty-two instructors in electrical engineering from universities in all parts of the United States on July 6. Mr. P. M. Lincoln, past-president of the American Institute of Electrical Engineers and head of the department of electrical engineering in the University of Pittsburgh, spoke on "The Relation of Education to Industry" at the meeting in Thaw Hall in the afternoon. Dr. S. R. Scholes of the Mellon Institute told the visitors of the purpose and work of that department of the university, and Dean F. L. Bishop of the school of engineering also spoke. The instructors later inspected the Mellon Institute and the laboratories of the university. For dinner they were the guests of the university at the University Club. Dean Bishop was toastmaster, and among those who spoke were Dean G. B. Thomas of Colorado College, Mr. H. P. Davis and Mr. T. P. Gaylord, vice-presidents of the Westinghouse company; Mr. Alexander Taylor, manager of works; Mr. P. M. Lincoln and Mr. C. R. Dooley.

Convention Tour of Telephone Pioneers.—The fifth annual convention of the Telephone Pioneers of America will be held in San Francisco, Cal., on Sept. 21, 22 and 23. Headquarters will be at the St. Francis Hotel. The business meeting will be held in the morning of Sept. 21 and in the evening the annual banquet will be given by the American Telephone & Telegraph Company. On Sept. 22 the Pacific Telephone & Telegraph Company has invited members and their friends to make a trip to Sausalito and Mount Tamalpais. A telephone reunion will be held on Sept. 23 at the exhibit of the American Telephone & Telegraph Company in the Panama-Pacific International Exposition. There will be demonstrations of transcontinental telephony in which all will be invited to participate. The special train for this convention will leave New York, Boston and Philadelphia on Sept. 14 and Chicago on Sept. 15. On Sept. 16 a short stop will be made at Omaha. At Denver four hours will be spent on Sept. 17, giving an opportunity for a ride around the city. Sept. 17 and 18 will be spent at Colorado Springs. On Sept. 19 points of interest in Salt Lake City will be visited. San Francisco will be reached on Sept. 20. The return trip will be begun on Sept. 26 and two days will be spent at Los Angeles and in the surrounding country. A trip will be made to San Diego, affording a day for a visit to the exposition there. On Oct. 1 the train will be taken to Los Angeles. At this point members of the party will have the option of returning by direct route to Salt Lake and Chicago or on the special train via the Atchison, Topeka & Santa Fé Railway to the Grand Canyon, Kansas City and Chicago.

Public Service Commission News

Oregon Commission

The Thompson Falls Power Company and the Montana Power Company have filed with the Oregon Utilities Commission their respective answers to the complaint filed against them by the Washington Water Power Company, which the commission in an order issued recently refused to dismiss.

Both answers admit and deny in part the several allegations made by the Washington Water Power Company relative to the delivery of electrical energy in the northern Idaho electrical field, which heretofore has been in control of the Washington corporation. Directly involved in this case is the constitutionality of an act passed by the last Idaho Legislature by which an extensive amendment was made to Section 48 of the public utility act which permits consumers to receive service from power companies with plants generating power in other states. The Washington Water Power Company contends in its complaint that the amendment is null, void and of no effect, and that it creates a purely arbitrary discrimination or classification, in violation of the constitution of the State and of Section 14 of the constitution of the United States. This claim is denied by the Montana and Thompson Falls companies in their answers.

Maryland Commission

Recent action of the Maryland Public Service Commission in suggesting changes in the personnel of the operating staffs of utility companies under its jurisdiction has been criticised by persons in that State who regard such steps as radical. The commission is alleged to have advised the officials of one company to dismiss their superintendent and is also declared to have advised another corporation to take on another man for a certain purpose. It is understood that the power of the commission to order one corporation to dismiss an employee and order another to employ one will be contested. The commission had received frequent complaints from patrons of one company regarding the quality of gas and electricity furnished. Investigation by the commissioners and their engineers finally resulted in action by the commission for the purpose of removing the official concerning whom complaint had been made.

The commission last week sanctioned a deposit of stocks and bonds by the Cambridge Electric Light & Power Company for purposes assigned by the Eastern Shore Gas & Electric Company, which has taken over the first-mentioned utility company. A similar order was granted in the case of the Salisbury Light, Heat & Power Company, which also has been taken over by the Eastern Shore Gas & Electric Company.

New Jersey Commission

The board has handed down a decision ordering the Farmingdale Lighting Company to discontinue the practice of allowing its officers and employees different rates of discount from those given to other purchasers of electrical energy.

The board finds upon investigation that widely different rates of discount have been allowed, officers and certain employees being granted a discount of 25 per cent and linemen a discount of over 66 per cent if bills were paid within the required time. The company sought to justify this discrimination in favor of its officers upon the ground that they received no salary or other compensation. The board holds that this was not a valid reason, and in its decision says:

"It has been held repeatedly that a director, stockholder or employee of a utility company is entitled to no preference or advantage in the matter of the rate he is to pay for service; the only exceptions are those expressly made by statute. They should all be charged the regular rate; matters of salaries and wages should be treated on a more businesslike basis than discrimination in rates for service. Under the public utility act of this State, providing that no public utility shall make any unjustly discriminatory or unduly preferential rate or give unreasonable preference or advantage to any person or corporation, the practice at issue is illegal, and the company is ordered to discontinue this discrimination.

The board has rendered a decision in the complaint of the Union National Bank of Frenchtown versus the Frenchtown Electric Light & Power Company, finding that it would be just and reasonable for the company to render service to the bank at a flat-rate basis of $3 per month, and revoking its order fixing a charge of 15 cents per kw.-hr. made last December.

New York Commissions

Mr. Ledyard P. Hale, counsel for the Second District commission since its organization, has been given a leave of absence until Sept. 1 on account of the press of his duties as chairman of the public utility committee of the Constitutional Convention. As he was unwilling to accept salaries from the State both as a delegate to the convention and as counsel to the commission, he has been on leave without pay since May 1, although considerable of his time has been given to the commission. Under the circumstances Mr. Frank H. Mott of Jamestown, formerly a deputy attorney general, and for the last two years secretary to the commission, has been named counsel. It is understood that Mr. Mott will resume his private practice of law upon Mr. Hale's return. Mr. Francis X. Disney of Elmira has been named secretary of the commission to succeed Mr. Mott. Mr. Disney has been assistant secretary for the last two years.

The first step in the appeal from the recent decision of the Second District commission denying the Ulster & Delaware Railroad permission to raise its mileage rate above the 2-cent maximum set by the Legislature was taken on July 16, when the commission formally denied the application for a rehearing. In denying the rehearing the commission says clearly that it refused the proposed increase only on the ground that it did not have the power to grant it. While the commission is of the opinion that the rate complained of is insufficient to yield reasonable compensation for the service rendered, it holds that it has no jurisdiction to grant the increase. The question of jurisdiction may now therefore be presented to the courts for final settlement.

On July 15 the legislative investigating committee began sessions in New York to consider suggestions for changes in the public service commissions law. Other hearings will be held in New York and also at various points in the State. Senator Thompson, chairman of the committee, said:

"We can provide for reform in the public service commissions law, but the constitution will attend to the organization. We believe the law should be amended so that the people can get some action from the commission. It is my opinion that both water companies and ferries, municipally owned and otherwise, should come in under the Public Service Commisisons. If the municipally owned companies are not making money and are charging over deficits to general taxation, I think they ought to be made to raise their prices so as to do away with the deficits. Another thing: it is an economic waste to let a municipality parallel the lines of a water company that it does not like in order to bring it to terms. If it does not like a company, let it condemn the land on which its lines are situated and take it over. This committee may recommend a law to cover such a case. We will use the model bill for the regulation of public utilities prepared by the National Civic Federation."

Mr. F. A. Stratton, president of the Westchester Lighting Company, Mount Vernon, N. Y., made suggestions to the committee, in part as follows: "If the public service commissions law were amended and then administered, as it might well be, by able and competent commissioners, it would, in my opinion, save the State $1,000,000 a year and obtain results for its citizens fully as good as those now secured."

West Virginia Commission

Among the rules laid down on July 16 by the West Virginia Public Service Commission is one which will require that all gas and electric energy sold in the State after Jan. 1, 1916, must be sold by meter service, except in the case of window and outside decorative illumination, street lighting, transient customers and limited service of a specified kind.

Personal

Mr. C. A. Yarrington has been appointed manager of the South Boston Electric Light & Power Company, South Boston, Va.

Mr. I. T. Roberts, formerly electrical engineer for the Railway Utility Company of Chicago, has resigned his position.

Mr. W. E. Moore, vice-president and general manager of the West Penn Traction properties, Connellsville, Pa., has resigned his position with the various West Penn companies to open an office as consulting engineer at Pittsburgh, Pa.

Mr. Theodore N. Vail, president of the American Telephone & Telegraph Company, on July 17 celebrated his seventieth birthday at his Vermont farm. He was born in Ohio and received his early education in Norristown, N. J., where for two years he studied medicine with his uncle, acquiring in the meantime a working knowledge of telegraphy, which later enabled him to become agent and telegraph operator for the Union Pacific Railroad at one of its small stations. In 1869 he was appointed clerk in the railway mail service, in which capacity he was soon recognized as a systematizer and organizer. A government appointment as assistant superintendent of the railway mail service followed, and in 1876 he became general superintendent, all of the time taking a leading part in the development of fast railway mail service. In 1878 he accepted the position of general manager of the American Bell Telephone Company, a company formed to exploit the telephone, then a recent invention. In 1885 he became the first president of the American Telephone & Telegraph Company, resigning two years later, and in 1890 he retired entirely from the telephone field to take up farming. From then until 1907 he traveled much and became interested in and developed a South American railway system. Urged by prominent telephone men, he again in 1907 took up the duties of president of the American Telephone & Telegraph Company, and has since then continued to preside over the company's affairs. Mr. Vail is engaged in a number of activities outside of the telephone field, of which probably his work in teaching agriculture to country lads at the Lyndon (Vt.) Agricultural School, which he founded, is the most interesting. Mr. Vail believes the future wealth of the country to be in farming, and he wants the boys of to-day to share in it. He received the degree of Doctor of Law first in 1912 from Middlebury (Vt.) College and again in 1915 from the University of Princeton.

T. N. VAIL

Mr. E. P. Coleman, general manager of the Dominion Power & Transmission Company of Hamilton, Ont., Canada, was elected president of the Canadian Electric Railway Association at its recent annual convention at Quebec.

Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, San Francisco, Cal., sailed from San Francisco on the steamship Siberia July 10 for a vacation in the Orient. A number of Mr. Britton's friends accompanied him to the dock and gave him a rousing farewell.

Mr. John G. Felton, for the last five years chief engineer for the Fulton County Gas & Electric Company, Gloversville, N. Y., has been appointed superintendent of the electrical department of the Charleston (S. C.) Consolidated Railroad & Lighting Company, which, like the Fulton County company, is a subsidiary of the United Gas & Improvement Company of Philadelphia.

Mr. William G. Keith, who was recently named commissioner of gas and electricity for the city of Chicago to succeed Mr. Ray Palmer, whose resignation becomes effective Aug. 1, was born at Logansport, Ind., in 1881. In 1894 he joined the Chicago staff of the Siemens-Halske Electric Company and was later employed by the Western Electric Company to install generating-station equipment. Early in his career Mr. Keith also gained experience in the electric-traction field in the employ of the Indiana Union Traction Company. From 1903 to 1908 he operated a contracting and engineering business under the name of the Electrical Equipment Company of Chicago. For the last seven years he has been assistant electrician for the West Park Commission of Chicago and during that time has had actual charge of construction and maintenance of the six substations and the 1800 tungsten-filament incandescent and flame-arc lamps which are operated by the West Park Commission.

Mr. William A. Del Mar has resigned from the engineering staff of the New York Central Railroad to take up new work for the Interborough Rapid Transit Company of New York City in connection with technical problems relating to the new subways to be operated by that company. Mr. Del Mar was born at San Francisco in 1880 and received his education in private schools in France and England, being graduated in 1900 from the City and Guilds College, London. After experience in the General Electric Company's testing department at Schenectady, N. Y., in 1901 and 1902, Mr. Del Mar joined the staff of the Manhattan Railway Company. From 1904 until the present time he has been connected with the New York Central Railroad. He has been a member of the A. I. E. E. standards committee both last year and this, acting in 1914 as chairman of the Institute's committee on railway standards. At present he is the chairman of the Institute's wire and cable committee, which is engaged in standardizing cable stranding, and also chairman of the wire and cable committee of the Association of Railway Electrical Engineers. Mr. Del Mar is the author of a work on "Electrical Power Conductors" and has been a frequent contributor to the technical press.

Mr. G. R. G. Conway, for the last four years chief engineer of the British Columbia Electric Railway Company of Vancouver, B. C., has resigned that position to take up work as general consulting engineer, with offices in Toronto. In connection with his new engineering work Mr. Conway has been appointed consulting engineer for the British Columbia company. Mr. Conway's term of service with the "B. C. Electric" covered a period of very rapid development, during which he carried out for the company many large undertakings. Among these were the construction of the great dam at the outlet of Lake Coquitlam; the enlargement of the company's existing power house on the North Arm of the Inlet, and the construction of the new No. 2 power house, increasing the output of the Coquitlam-Buntzen hydraulic project to over 85,000 hp.; the construction of a 130-ft. dam on the Jordan River, Vancouver Island, and the consequent enlargement of the Jordan River power plant to a rating of 20,000 hp.; the construction of a steam auxiliary plant at Brentwood Bay; the enlargement of the Vancouver steam auxiliary plant, and the laying of many extensions of lines on both the mainland and the island. Mr. Conway received his early training in Great Britain. There he was connected with many large engineering projects and performed important work for the cities of Birmingham and Aberdeen. Later he went to Mexico, where he carried out engineering projects for the Monterey Railway, Light & Power Company. Mr. Conway is a member of numerous engineering organizations in Europe and America, and has contributed many valuable addresses and papers for the records of these societies. The retirement of Mr. Conway was marked by a dinner tendered him by officials of the company at the Hotel Vancouver, Vancouver, June 26. Mr. George Kidd,

G. R. G. CONWAY

general manager, presided at the gathering and read a cablegram from the London board of the company expressing regret at the retirement of Mr. Conway and appreciation of his work for the company. The office staff also presented Mr. Conway with a handsome solid-silver rose bowl mounted on an oak base.

Mr. Ray Palmer, who has resigned, effective Aug. 1, after serving three years as commissioner of gas and electricity for the city of Chicago, was born at Sparta, Wis., in 1878. He was graduated from the University of Wisconsin in 1901, and soon after his entrance into the practical field he became connected with J. G. White & Company. In the position of assistant superintendent of construction for this company he had charge of the installation of the street-lighting system in Greater New York City. Later he was transferred to the London (England) office of J. G. White & Company with the title of electrical engineer. On his return to America several years later he accepted a position as electrical engineer for the Union Traction Company of Chicago. Severing his connection with the traction company in 1906, he practiced as a consulting electrical engineer in Chicago and Milwaukee until 1912, when he was appointed commissioner of gas and electricity for Chicago by Mayor Carter H. Harrison. During Mr. Palmer's term of office about $4,000,000 has been spent in rehabilitating the city's lighting system and replacing old-style arc lamps with modern tungsten-filament units. Mr. Palmer is a Fellow of the American Institute of Electrical Engineers and a member of the Western Society of Engineers. He plans to resume his consulting engineering practice in Chicago.

RAY PALMER

Obituary

James J. Murphy, formerly general cashier for the Commonwealth Edison Company of Chicago, died at Prescott, Ariz., on July 16.

Samuel E. Vincent, who as president of the Bridgeport (Conn.) Business Men's Association drafted the Connecticut Public Utilities Commission act, died at his home on July 19.

James W. Wigman, thirty years old, is dead at Lafayette, Ind. Mr. Wigman was a graduate of the electrical engineering school of Purdue University and of the engineering course of the Westinghouse company at East Pittsburgh, Pa.

John Hier, fifty-three years old, superintendent of the municipal electric-lighting plant at Huntington, Ind., is dead of heart trouble. Mr. Hier had been connected with the lighting and other departments of the city for the last seventeen years. He is survived by his widow and one son.

William H. Gerrish, chief smoke inspector of the Massachusetts Gas and Electric Light Commission, died at Malden, Mass., on July 15, as the result of burns received in a garage fire on the preceding Sunday. Mr. Gerrish was well known in the New England engineering field and had borne chief responsibility in the enforcement of the Massachusetts smoke law of 1910, which enlarged the powers of the commission to include jurisdiction over locomotive, stationary and marine stacks in Boston and its environs. He was born in Lowell, Mass., about forty-nine years ago, and after being graduated from the Massachusetts Institute of Technology in 1888 became mechanical superintendent of the Massachusetts Cotton Mills at Lowell. During the Spanish-American war he was attached to the Ordnance Department at Washington. He was engaged in textile mill work at New York until his appointment to the chief inspectorship under the Massachusetts smoke prevention law.

Corporate and Financial

Brookville (Ind.) Electric Light Company.—The company has petitioned the Public Service Commission of Indiana for authority to issue bonds in the sum of $10,000. The proceeds from the sale of the bonds are to go into improvements.

Consolidated Gas, Electric Light & Power Company of Baltimore, Md.—On July 10 the first month of the new plan of selling stock to customers ended. During the month 741 customers took advantage of the offer and subscribed for more than 3000 shares at 106.5. On the last day on which this price held more than 100 customers subscribed for somewhat under five shares each. During the month ending Aug. 10 the price will be one point higher, or 107.5. About twenty-eight or thirty customers have subscribed at the new price.

Edison Light & Power Company, York, Pa.—The merger of the company with the Merchants' Electric Light, Heat & Power Company and five small suburban companies controlled by the Edison company took place July 15. The new company is capitalized at $3,301,000.

Empire Gas & Electric Company, Auburn, N. Y.—The Public Service Commission of the Second District of New York has approved the merger of the company with the Weedsport Electric Company, which the Empire company acquired two years ago. Weedsport officials opposed the operation of the Empire company in that town, and the case has been through the courts. Litigation is still pending before the Court of Appeals.

Halifax (N. S.) Power Company.—The city of Halifax received an offer on July 7 from Mr. S. M. Brookfield, president of the company, of the right to purchase a half interest in the company at cost. Mr. Brookfield wrote as follows: "The Halifax Power Company owns the nearest and best water-power for the supply of hydroelectric power to the city. It now offers the city one-half of the undertaking at the same price as it has cost the company. It has the right to supply light and power in the city, so that if the city acquire the power company's property or join it in the development of the undertaking the street lighting could be done and 50 per cent more light supplied for the price now paid. Private lighting and small motor users could also be supplied at a saving of at least 25 per cent."

L. B. Lincoln Electric Works, Chicago, Ill.—At a special meeting of the stockholders of the company held on June 29, a resolution was adopted increasing the capital stock from $6,000 to $25,000.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—The quarterly dividend paid July 15 on the preferred stock was reduced from $1.50 to 75 cents. This reduction the board of directors stated is due to a decrease in earnings caused by the operation of jitney buses at a time when business conditions have been generally unsatisfactory. The board of directors has sent out the following statement to stockholders: "The jitney first appeared in the Puget Sound district in January of this year, rapidly increasing in number until in February and March there were some 700 automobiles in operation, resulting for a time in a loss in gross earnings to the company of over $2,000 per day. A careful study of jitney operation throughout the country gives every indication that such cars under fair and reasonable regulation cannot be operated permanently and profitably in competition with street railways. A gradual decrease in such competition is, therefore, to be expected, and such decrease is already taking place in the Puget Sound cities, the number of cars now in operation being under 400. It is the opinion of the directors that neither the business depression alone nor the operation of the jitney alone would have affected earnings to such an extent as to make the reduction of dividend advisable. The company is at present in a strong position financially, having a substantial cash balance and only a small floating debt. The directors believe that this position should be maintained. As the company has had but six months of jitney competition, and as under most favorable circumstances this competition will not immediately disappear, they feel that the company's resources should be conserved through postponing the payment of a portion of the preferred-stock dividend. The import and

export business of the Pacific Northwest has shown a marked increase during the past six months, and there are indications of improvement in other lines of business. A return of general business toward normal conditions or a further reduction in the operation of jitneys should warrant the resumption of preferred stock dividends at the regular rate. The preferred stock is cumulative and, therefore, any deferred payments must be made up before dividends are paid on the common stock."

St. Petersburg (Fla.) Lighting Company.—An issue of $300,000 of first mortgage 6 per cent sinking-fund gold bonds, dated June 1, 1915, and due June 1, 1945, is being offered at 97.5 and interest to yield 6.18 per cent. The earnings for the year ended May 31, 1915, follow:

Gross revenue	$92,430
Operating expenses and taxes	55,040
Net from operating	$39,390
Bond interest	18,000
Surplus	$21,390

Shawinigan Water & Power Company, Shawinigan Falls, Quebec, Canada.—Stockholders of record July 10 are offered the privilege until Aug. 30 of subscribing for $1,237,500 of new common stock at par on the basis of 10 per cent of their present holdings. An alternative option gives them the right to exchange until Aug. 30 their subscription warrant for a negotiable option certificate entitling the holder to subscribe for the amount of shares covered by the warrant until June 30, 1916, at 105. The company recently purchased the properties of the Dorchester Electric Company of Quebec, and it is expected will in the near future scrap the Dorchester company's plant and supply the territory it formerly served from the large hydroelectric plant at Shawinigan Falls.

Southern Sierras Power Company, Denver, Col.—The California Railroad Commission has issued an order authorizing the company to execute a mortgage and trust deed for an unfixed amount to the Los Angeles Trust and Savings Bank and the International Trust Company of Denver, trustees, dated Jan. 1, 1915, and to issue $3,668,000 of first and refunding series "A" 6 per cent fifty-year gold bonds, subject to the following conditions: $2,500,000 of bonds to be used to retire a like amount of first mortgage twenty-five-year bonds outstanding; $300,000 of bonds to be used to retire a like amount of 6 per cent twenty-five year bonds heretofore authorized by the commission; $70,000 of bonds to retire bonds of the Lytle Creek Power Company, a subsidiary; $798,000 of bonds to be sold to net not less than 90 plus accrued interest, to pay the company's debt to the Nevada California Power Company and to pay other debts to banks and corporations. The commission must approve such payments before made. The Nevada California Power Company is to guarantee the bonds, principal and interest, authorized by this order. The bonds will mature in 1965. A sinking fund, payable out of the net earnings, is to begin in 1920, to consist annually of three-fourths of 1 per cent of the aggregate par value of outstanding bonds. The company testified that its cash investment in its property amounted to $4,314,979.42, and that it owes the Nevada California Power Company $995,584. The same interests control both companies. The money represents advances to assist the Southern Sierras Power Company in constructing its electric plant. The commission says that the applicant merely desires to change its form of indebtedness to long-term bonds from notes and accounts payable. Its total interest charges for 1915 will be but $224,000, with over $400,000 to meet such charges. "This," says the commission, "is a noteworthy showing for a corporation organized so recently as in 1911 and operating with long transmission lines in a field that requires development."

Southern Utilities Company, Jacksonville, Fla.—A block of $575,000 of first mortgage sinking fund 6 per cent gold bonds due April 1, 1933, is being offered at 98 and interest to yield 6.2 per cent. The total amount of this issue now outstanding is $1,500,000.

United Gas & Electric Corporation, New York, N. Y.—The company has purchased and surrendered to the Fidelity Trust Company, trustee, for cancellation $1,000,000 of its three-year 6 per cent notes dated April 1, 1915. The corporation thus anticipates the retirement of $500,000 of these notes on July 1, 1916, and a further $500,000 on Jan. 1, 1917.

Manufacturing and Industrial

The Electrical Service Equipment Company, 47 North Thirteenth Street, Philadelphia, Pa., dealer in electric motors, appliances and supplies, has moved into larger quarters at the above address.

The Western Electric Company, 463 West Street, New York, is now marketing the electric hammer made by the Electro-Magnetic Tool Company, Chicago, Ill., described in the ELECTRICAL WORLD of June 5, 1915.

Federal Sign System (Electric).—Mr. William E. Finlay, a former representative of the Detroit Fuse Manufacturing Company, has accepted a position as salesman with the Federal Sign System (Electric) of Chicago.

Engberg's Electrical & Mechanical Works, St. Joseph, Mich., manufacturers of direct-connected generating sets, searchlights and electric-hydraulic valves, have opened an Eastern office at 39 Cortlandt Street, New York.

The Columbia Products Company, 1012 Garfield Building, Cleveland, Ohio, has obtained the exclusive right to sell the whiting and filler formerly handled by the Columbia Chemical Company and the National Whiting Company. These products will hereafter be known under the trade names of "Columbia whiting" and "Columbia filler."

Automobile-Accessory Business Good.—The Emil Grossman Manufacturing Company, Brooklyn, N. Y., manufacturer of "Red Head" spark plugs, "Red Rib" cable, and various other electrical specialties for automobiles, has noted a considerable increase in its business in the past year, the increase being some 55 per cent greater than that of any previous year. The company is contemplating adding equipment to its plant to increase its output and to facilitate taking care of the large amount of business being received.

Electrical Control Apparatus in the New Equitable Building.—The electrical equipment for the new Equitable Building of New York contains a number of pieces of apparatus made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., including the speed regulators for each of the twenty-seven motor-driven fans of the ventilating system, an automatic starter for controlling the series ejector system, a rear-of-board starter for the circulating pumps, and charging equipment for the master-clock system.

Sale of Mining Company's Power Plant.—The Morse Brothers Machinery & Supply Company, Denver, Col., has purchased the entire power plant recently erected at Wilkenburg, Ariz. The plant was built to furnish power for the Octave Mining Company, 14 miles distant. The plant consists of a 200-kw. and a 550-kw. Westinghouse alternator driven by Corliss engines. The steam plant consists of Babcock & Wilcox boilers fired with oil. The transmission line was operated at 22,000 volts. All of the material will be dismantled and will be sold or removed to the Denver house of the Morse Brothers company.

Starrett Electric Company, Chicago.—Mr. H. A. Stevenson has resigned his position as assistant electrical engineer for the Underwriters' Laboratories, Inc., and has become connected with the Starrett Electric Company of Chicago, manufacturer of electrical distributing apparatus, for which he acts in the capacity of sales engineer. Mr. Stevenson, who is a Jovian, is well known through his connection with the laboratories and, previously, with the educational field as head of the electrical department of the Columbus Trades School, for his activities in promoting high standards for electrical fittings and construction.

Picnic for Employees of Hawthorne Works of Western Electric Company.—About 5000 employees of the Hawthorne works of the Western Electric Company, Chicago, are expected to attend the fifth annual outing on July 24 at Michigan City, Ind. A feature of the outing will be a departmental parade in Michigan City, for which three prizes will be offered. The first prize will be a silver cup to be awarded to the department making the best appearance; the second prize, a banner, is to go to the girls' department making the best appearance, and the third prize is to go to the department of men making the best showing. The picnickers will cross to Michigan City on the Lake steamers Theodore Roosevelt and United States.

Sale of Storage Battery Company's Plant.—A report of the sale of the United States Light & Heating Company of Niagara Falls and Buffalo, N. Y., was recently filed in the United States District Court by Mr. A. Rebadow, representing the receivers, Messrs. J. O. Moore, J. A. Roberts and J. Allan Smith. The property went to the highest bidder for the sum of $1,000,100. The buyers are members of the stockholders' protective committee, of which Mr. W. H. Brown is chairman.

Highest Award in Its Class for Underground-Cable Exhibit.—The Standard Underground Cable Company, Pittsburgh, Pa., has been awarded a gold medal, the highest award in its class, by the International Jury of Awards of the Panama-Pacific International Exposition for its exhibit of electric wires, cables, and cable accessories. This is the seventh similar award which has been received by the company in as many different expositions. An interesting feature of the company's exhibit is the use of copper ingots as posts and a large stranded bare-copper cable as railing for inclosing its exhibit space. Two braiding machines are shown in operation, weaving cotton insulating braid on a copper wire.

Archbold-Brady Towers for Iowa Transmission Line.—The Archbold-Brady Company, Syracuse, N. Y., reports the sale of structural-steel towers for 28 miles of transmission line to be built by the Iowa Railway & Light Company, Cedar Rapids, Iowa, between Blairstown and Tama, Iowa. This will be a 66,000-volt, single-circuit, three-phase transmission line on suspension-type insulators. The line will be supported on 48-ft. A-frame towers, set at 440-ft. standard-span intervals, with lace-channel poles at special locations and square towers for anchoring line ends and at heavy angles. The transmission conductors will be steel-reinforced aluminum cables, protected by steel ground wires. The order was placed by Mr. S. C. Dows, purchasing agent, and Mr. J. M. Drabelle, electrical engineer.

Insulated Wire Market.—With a lessened demand and large production, many wire manufacturers find themselves with very large stocks on hand and are therefore accepting orders at practically the buyers' prices. Last fall, when copper was down to the 12 cent level, many wire manufacturers stocked up with the assurance of an early increase in the price of this commodity. Copper is now selling around 20 cents, and one jobbing house expressed the opinion that it would ultimately reach 27 cents before it permanently settled back. The greatly decreased amount of new construction this year compared with last year has greatly lessened the demand for insulated wire. This, coupled with the need of money and carrying charges on the stock, has necessitated a sacrifice on the part of the wire manufacturers.

South American Delegates Entertained by Western Electric Company.—A number of the South American delegates to the Pan-American Financial Conference held recently at Washington were entertained by the Western Electric Company at the time of the South American party's visit to New York City. The delegates were first taken through the engineering laboratories of the company's general offices, where they were shown experimental work under way, and then were escorted to the exhibition room, where they had an opportunity to see and examine the various kinds of apparatus which the company manufactures and sells. After partaking of an electrically cooked luncheon the party talked on the transcontinental line with their national consuls at San Francisco, use of the wire being granted through the courtesy of the American Telephone & Telegraph Company.

New Plant for Hygrade Lamp Company.—A new four-story brick building occupying a plot 200 ft. by 50 ft. is being built at Boston and Federal Streets, Salem, Mass., for the Hygrade Incandescent Lamp Company, Danvers, Mass., manufacturer of drawn-wire tungsten lamps. The company will move into this new building about Nov. 1 and will then consolidate its plants, which are now at Danvers, Mass., and Newark, N. J. The company will increase its present output of 6000 lamps a day to 20,000 lamps a day. Based on its present production of 6000 lamps a day, the sales for January, 1914, were 17 per cent; for June, 1914, 47 per cent; for January, 1915, 71 per cent, and for June, 1915, 100 per cent. For January, 1916, it is estimated they will reach 180 per cent. Among the orders received by the Hygrade company is one from the State of Massachusetts for $20,000 worth of lamps.

First Electric Vehicle for City of Edinburgh, Scotland, Is of American Make.—The corporation of Edinburgh, Scotland, recently purchased its first electric vehicle. This car, which has a capacity of 1.5 tons, is of American manufacture and is equipped with an Edison battery. With a full charge the car is capable of traveling a distance of 40 miles fully loaded. The committee in charge of the municipal electric plant intends to encourage the further use of electric vehicles for both commercial and pleasure uses, and has undertaken to supply electricity for the charging of such vehicles at the rate of 1d. (2 cents) per unit. Arrangements have also been made for garaging electric vehicles in the municipal electric stations. It is considered not unlikely that as a result of this campaign there will be a fair demand for commercial electric lorries and vans and also for electric passenger cars for pleasure and professional use.

Recording Instruments Shown in Operation at San Francisco Fair.—Various types of indicating and recording instruments for measuring pressure, temperature, speed and time, and automatic temperature controllers and orifice meters, are on display in the booth of the Industrial Instrument Company and the Foxboro Company at the Panama-Pacific Exposition. Many of these instruments are shown in actual operation. Among the latter is an orifice meter of recent development, used for measuring flow of air. An automatic temperature controller, a recording thermometer, two liquid-level recorders, a vacuum recording gage and a gas-pressure recording gage are mounted on a frame and are utilized in the operation of a controller and for indicating varying water levels in a tank, the vacuum on the controller system, and the pressure of the service-gas system of the Machinery Palace. A frequency meter, the design of which is based on the principle devised by Dr. Horn, is also employed to indicate on a continuous chart the number of cycles per second of the electrical supply circuit.

Busch-Sulzer-Diesel-Engine Day at Panama-Pacific Exposition.—July 5 was celebrated as Busch-Sulzer-Diesel-engine day at the San Francisco Exposition, the ceremonies taking the form of a reception which was attended by more than 500 guests. Lieut. G. W. Danforth, chief of the department of machinery, presided and introduced the speakers. Mr. C. V. Vogelsand, representing President Moore of the Exposition, tendered a bronze medal to Mr. W. S. Heger, Western manager of the Busch-Sulzer Brothers company. Lieutenant-Commander Woodward, U. S. N., told of the use of the Diesel engine in the navy; Mr. Guy C. Bayley, chief electrical and mechanical engineer of the Exposition, explained in non-technical language the theory of the engine, and Mr. Heger gave a brief historical sketch of the development of the Diesel engine. The exhibit of the Busch-Sulzer-Diesel Engine Company includes a 500-hp. unit which is directly connected to a direct-current 250-volt Westinghouse generator. To show what a simple operation it is to start the engine, the engine was placed in operation by three young women.

Annual Sales Convention of American Rotary Valve Company.—The annual sales convention of the American Rotary Valve Company was held at Anderson, Ind., July 3 to 5. During the meetings lectures were given by Prof. W. Trinks of the Carnegie Institute of Technology, Pittsburgh, Pa., on "The New Residence Vacuum Machine"; by Mr. G. A. Arnold, on "The Road to Greater Sales"; by Mr. W. T. Hensley, on "Jenney Motors from an Engineer's Standpoint"; by Mr. G. T. Rosselle, on "From the Shop Angle"; by Mr. L. L. Goding, on "The Publicity Department"; by Mr. W. A. McKinney, on "Productive Integrity"; by Mr. R. O. Bright, on "The Future of the American Rotary Valve Company"; by Mr. W. H. Aurelius, on "Credits and Collections"; by Mr. A. J. Loeb, on "Building a Territory"; by Mr. C. T. Reiss, on "Co-operation Between District Offices"; by Mr. W. B. Haviland, on "Wire-Pulling for Business"; by Messrs. Hensley, Dudley and Immerfall, on "Press Drives"; by Mr. R. J. Immerfall, on "Jenney Alternating-Current and Direct-Current Motors"; by Mr. J. L. Hadley, on "Jenney Single-Phase Motors"; by Mr. A. J. Loeb, on "How to Win

the Consulting Engineer and the Architect"; by Mr. R. J. Immerfall, on "Rotary and Reciprocating-Type Vacuum Cleaners," and by Mr. G. A. Arnold, on "The Psychology of Salesmanship." There also followed a general discussion of factory and branch-house motor stocks and customers' consignment stocks, led by Mr. R. O. Bright, and a general discussion of prices, discounts and terms of sale, led by Mr. G. A. Arnold.

NEW YORK METAL MARKET PRICES

	July 13 Selling Prices Bid	Asked	July 20 Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard, spot*	78 5 0		74 10 0	
Prime Lake	19.62½ to	19.78½	19.25 to	19.50
Electrolytic	19.37½ to	19.50	18.87½ to	19.12½
Casting	18.12½ to	18.25	17.37½ to	17.62½
Copper wire base	21.00 to	21.50†	20.50†	
Lead	5.75		5.75	
Nickel	50.00†		50.00 to	52.00†
Sheet zinc, f.o.b. smelter	27.00†		27.00†	
Spelter, spot	21.75 to	22.25†	20.25 to	20.75†
Straits tin	38.50		36.50	
Aluminum, 98 to 99 per cent	32.00 to	33.00	32.00 to	33.00

*OLD METALS

Heavy copper and wire	17.87⅞	17.00
Brass, heavy	13.50	12.00
Brass, light	10.50	10.00
Lead, heavy	5.00	5.00
Zinc, scrap	16.00	15.00

*COPPER EXPORTS

Total tons to July 20	6,691

*From daily transactions on the New York Metal Exchange.
†Nominal.

New Incorporations

The Elk River Power & Light Company of Elk River, Minn., has been chartered with a capital stock of $100,000 by F. D. Waterman, Eva Waterman and M. E. Waterman.

The Vernon Hydro-Electric Company of Vernon, Ind., has been incorporated with a capital stock of $1,000 by George C. Ale, F. T. Semon and others. The company intends to generate and distribute electricity.

The St. Cloud Public Service Company of St. Cloud, Minn., has filed articles of incorporation with the Secretary of State with a capital stock of $2,000,000. The company proposes to generate and distribute electricity. The incorporators are: A. G. Whitney, R. L. Gale, A. D. McKenzie, P. H. Collignon and W. H .Stewart, all of St. Cloud.

New Industrial Companies

The Thermal Appliance Company of New York, N. Y., has been chartered by C. C. Hansen, R. H. Hansel and V. D. Stearns, 27 West Eleventh Street, New York, N. Y.

The Great Eastern Electric Company of New York, N. Y., has been incorporated by A. and G. Hallberg and R. Lundin, 215 East Sixty-first Street, New York. The company is capitalized at $8,000 and proposes to manufacture and deal in machinery, engines, tools and appliances.

The Seaberg Elevator Company of Brooklyn, N. Y., has been incorporated by C. Johnson and G. and J. Seaberg, 158 Sixty-seventh Street, Brooklyn, N. Y. The company is capitalized at $100,000 and proposes to manufacture dumbwaiters, lifts, elevators, motors, cables, etc.

The Chantry Manufacturing Company of Portland, Me., has been incorporated with a capital stock of $100,000 for the purpose of manufacturing and dealing in all kinds of lighting devices. The officers are: Horace E. Eaton, president; Harold S. Richards, treasurer, and Benjamin G. Ward, clerk.

The H. M. C. Chemical Products Company of New York, N. Y., has been chartered with a capital stock of $5,000 for the purpose of dealing in construction materials, machines, telephones, electrical contrivances, etc. The incorporators are: W. L. Hatch, A. M. Mitchell and W. T. Hatch, 11 Union Square, New York, N. Y.

Trade Publications

Clamp Bushings.—The National Metal Molding Company, Pittsburgh, Pa., has issued a folder which contains information on its No. 377 clamp bushings.

Strain Insulators.—The Pittsburgh High Voltage Insulator Company, Derry, Pa., has prepared an illustrated folder which contains information on its high-voltage porcelain strain insulators.

Street-Lighting Brackets.—"Street-Lighting Brackets and Center-Span Fixtures for Tungsten Lamps" is the subject of Booklet Y-679 issued by the General Electric Company, Schenectady, N. Y.

Screw Anchors.—W. N. Matthews & Brother St. Louis, Mo., have issued a folder which contains information on their "Scrulix" anchor, which was described in the ELECTRICAL WORLD of July 17.

Bronze Castings.—"Titanium Aluminum and Other Standard Bronze Castings" is the subject of an illustrated catalog recently published by the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

Recording Instruments.—The Bristol Company, Waterbury, Conn., has issued an illustrated booklet which describes its exhibition of recording instruments at the Panama-Pacific International Exposition at San Francisco.

Lightning Arresters.—"Garton-Daniels Lightning Arresters" is the title of an illustrated catalog which contains information on lightning arresters, choke coils, disconnecting switches, and various other fittings for lightning arresters.

Portable Battery-Operated Searchlamp.—The Edison Storage Battery Company, 1290 Lakeside Avenue, Orange, N. J., has issued an illustrated folder which contains information on a portable battery-operated searchlamp which was described in the ELECTRICAL WORLD of July 17.

Lighting Salesmen's Handbooks.—The Westinghouse Lamp Company, 1261 Broadway, New York, has prepared salesmen's lamp handbooks No. 2, entitled "The Lighting Dictionary," and No. 3, entitled "Modern Lighting Practice." These books are included in a series of handbooks being published for lighting salesmen.

Electric Ambulances and Trucks for Department Stores.—The General Vehicle Company, Long Island City, N. Y., is sending out a catalog on electric trucks for department stores and high-class retailers which contains illustrations of a number of machines used for such service and an illustrated bulletin on its electrically operated ambulances.

Metal Seals.—The Metropolitan Engineering Company, Forty-second Street Building, New York, is sending out pages 3 and 4, section 6, which supersedes page 3, section 6, of a loose-leaf binder, and which contains information on a metal seal for restraining the public from unauthorized interference with service apparatus on the consumers' premises.

Insulating Paints and Compounds.—The Mitchell-Rand Manufacturing Company, John and Cliff Streets, New York, has prepared a folder which contains samples of various kinds of insulating fabric and paper and a folder entitled "Melting Points and How to Take Them," which describes and illustrates methods for taking the melting point of asphalt and pitch or an asphalt and pitch mixture.

Testing Service.—The Electrical Testing Laboratories, Inc., Eightieth Street and East End Avenue, New York, have prepared an attractively illustrated book which describes the origin and organization of the Electrical Testing Laboratories and the kinds of service performed. The book also contains information on laboratory apparatus installed by the Laboratories, Inc., which is available in its private laboratories rented to inventors and investigators.

Railway Electrification.—"Results of Electrification" is the title of an attractively illustrated catalog designated as Circular No. 1505 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The catalog is very complete and contains information on a number of different installations of electric-railway apparatus. The company has also issued Leaflet 3566 on its OIWC transformers of large ratings and Descriptive Leaflet No. 2362-C on its small alternating-current type CA motors.

Construction News

New England

GARDINER, ME.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 12, for construction complete, including mechanical equipment, lighting fixtures and approaches of the United States post office, at Gardiner, Me. Drawings and specifications may be obtained at the above office or from the custodian of site at Gardiner.

MEREDITH, N. H.—The Meredith El. Lt. Co. has completed its extension to Center Harbor, and is now erecting a transmission line to Meredith Neck, a distance of five miles along the shores of Lake Winnipesaukee, to supply electrical service to the summer houses in that vicinity. Further developments are also contemplated by the company. The distribution system of the Center Harbor El. Lt. Co. has been purchased by the Meredith company. A. H. Plaisted is local manager.

ENOSBURG FALLS, VT.—The electric-light commissioners are considering the installation of electric-light meters and reconstructing the street-lighting system.

BOSTON, MASS.—Bids will be received by the schoolhouse commissioners of the city of Boston, Room 1009, City Hall Annex, Boston, until July 27 for furnishing and installing wiring and electrical material in the East Boston High School, Marion and Princeton Streets, East Boston. Bids will also be received at the same time and place for furnishing and installing wiring and electrical material in the English High School, Montgomery Street, Boston. Proposal blanks may be obtained at the above office.

NORTH ATTLEBORO, MASS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 12 for construction, including mechanical equipment, lighting fixtures and approaches, of the United State post office at North Attleboro, Mass. Specifications can be obtained at the above office or from the custodian of site at North Attleboro.

NEW BRITAIN, CONN.—The United El. Lt. & Wtr. Co. has applied to the City Council for permission to install ducts by means of subway in Myrtle Street through which wires will be run to supply electricity to many of the local factories. A. J. Campbell is manager.

Middle Atlantic

BUFFALO, N. Y.—Bids will be received at the office of the lighthouse inspector, Buffalo, N. Y., until July 26 for furnishing approximately 6900 ft. of submarine cable. Blank proposals, etc., may be obtained at the above office.

CASTLETON, N. Y.—Within the next three months the Schodack Lt. & Pwr. Corpn. of Castleton expects to purchase a few meters and to purchase within the next thirty days a few "Hotpoint" appliances. L. M. Lansing is treasurer and manager.

CAZENOVIA, N. Y.—The Cazenovia El. Co. has recently installed a 17-in. by 20-in. Ames unaflow engine, condensing. Henry Burden is president.

CENTER VILLAGE, N. Y.—The Afton-Windsor Lt., Ht. & Pwr. Co. of Center Village expects to purchase wire and inside wiring material, fixtures, etc., for house-wiring campaign. W. E. Bennett is general manager.

DUNKIRK, N. Y.—The installation of a fire alarm system in Dunkirk is reported to be under consideration.

ELLISBURG, N. Y.—The Public Service Commission has granted Frank E. Hamm permission to construct an electric-light plant and exercise franchises in the town and village of Ellisburg.

FULTON, N. Y.—The controversy between the Fulton Lt., Ht. & Pwr. Co. and the Oswego River Pwr. Trans. Co. of Syracuse has been settled. The latter company agrees to limit its service in Fulton to the Victoria Paper Co. and to retire from the field at the expiration of its contract.

JAMESTOWN, N. Y.—The Western New York El. Co. of Jamestown has been authorized by the Public Service Commission to exercise its franchise to supply electricity in the town of Ellicott.

LA FARGEVILLE, N. Y.—The Public Service Commission has granted the La Fargeville El. Lt. Co. permission to erect electric distribution systems in the towns of Orleans and Theresa.

MANNSVILLE, N. Y.—The Public Service Commission has approved the application of C. A. Keller to supply electricity in Mannsville. Mr. Keller has an electric generator in his mill and has been granted a franchise to light the streets of the village.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Park Avenue and Fifty-ninth Street, New York, until July 26 for alterations and additions to the electric equipment in the hall of the board of education, 500 Park Avenue, borough of Manhattan. Blank forms, plans and specifications may be obtained at the office of the superintendent.

PERRY, N. Y.—The Perry El. Co. expects to erect within the next three months 6 miles of transmission line between Berry and Silver Springs; also 9 miles between Perry and Warsaw. Material for the above extension will be purchased by Ed. Phillips & Co., 50 Church Street, New York, N. Y. C. W. Torrey is manager.

PULASKI, N. Y.—Extensions contemplated by the Pulaski El. Lt. Co. have been approved by the Public Service Commission, which include the construction and operation of electric distribution systems in accordance with franchises granted in the villages of Laconia and Sandy Creek and the town of Sandy Creek.

TUPPER LAKE, N. Y.—The Municipal Electric Light Department expects to purchase within the next two months 2000 ft. of No. 12 duplex standard weather-proof wire for street lighting. M. H. Presper is superintendent.

BALDWIN, PA.—The Township Commissioners have decided to erect new electric lamps along the roads in the township, bids for which, it is understood, will soon be asked for.

CHAMBERSBURG, PA.—The Council has adopted a resolution providing for the installation of conduits and cables for an ornamental lighting system on the section of Lincoln Way east, now being paved. The type of lamp standard has not yet been selected.

COUDERSPORT, PA.—The Home El. Co. is installing a Westinghouse gas engine and expects to install within the next 90 days a new generator. The company is changing its system from 133 cycles, 1100 volts, to 60 cycles, 2300 volts. When improvements are completed a 24-hour service will be established. D. B. Belknap is superintendent.

HARRISBURG, PA.—Plans are being considered by the directors of the poor for substituting electrical power in place of steam for crushing stone at the almshouse quarries, driving the thresher, operating sawmills, etc., at the city poor farm. J. P. Guyer is clerk.

PITTSBURGH, PA.—The Vinton Colliery Co. of Intondale, Pa., is contemplating the erection of a new power plant, to cost about $50,000. Two new transmission lines are to be erected this summer.

PITTSBURGH, PA.—Application will soon be made to the Public Service Commission for approval of a contract between the township of Jefferson and the West Penn El. Co. of Pittsburgh for the installation of an electric lighting and power system in that township.

PORTAGE, PA.—Application has been made by the Portage Lt. & Pwr. Co. to the Secretary of State for a charter for the purpose of supplying electricity in the borough of Portage. The incorporators are Robert Pearce, William H. Troxell and Margaret Pearce.

RIDGWAY, PA.—The Ridgway El. Lt. Co., controlled by the Interstate Pub. Ser. Corpn. of Rochester, N. Y., expects to erect within the next three months a new fireproof power house. The company has recently purchased two turbine generating units, having a rating of 3000 hp., automatic stokers, condensing apparatus, boilers, switchboard, etc.; also material for distribution system and transformers (4000 kw.). J. George Kaelber of Rochester is president.

SEASIDE HEIGHTS, N. J.—The citizens have voted to issue $35,000 in bonds to purchase the local water-works system. An electric-light plant will also be purchased at a cost of $15,000.

WILLIAMSTOWN, N. J.—The Williamstown El. Co. expects to erect about 4000 ft. No. 0 wire to the Alart & McGuire catsup factory within the next 30 days to supply electricity for lamps and motors. J. F. A. Rachor is assistant general manager.

WOODSTOWN, N. J.—The Woodstown Ice & Cold Storage Co. expects to purchase six transformers and 20 meters, also a few electric irons and vacuum cleaners. E. B. Moore is assistant manager.

LEONARDTOWN, MD.—The City Commissioners are contemplating the installation of a municipal electric-light plant.

ASHLAND, VA.—The contract for installing electric power plant at the Randolph-Macon Women's College in Ashland has been awarded to T. J. Burns & Co. of Lynchburg. The plant will be driven by a 100-hp. engine.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 3, for furnishing at the various navy yards and naval stations the following supplies: Philadelphia, Pa., Schedule 8580—one electric capstan, three compound-geared electric winches, one electric windlass. Washington, D. C., Schedule 8578—miscellaneous brass gate valves, miscellaneous brass globe valves. Bids will also be received until Aug. 10 as follows: Norfolk, Va., Schedule 8608—16 water-tight annunciators, 312 brass gate valves; Schedule 8606—400 buoy lights; Schedule 8602—21,500 lb. 0.268-in. diameter steel wire. Washington, D. C., Schedule 8588—one steam hot-blast apparatus, one exhaust fan, one 5-hp. induction motor. Norfolk, Charleston, Schedule 8586—two sets steam turbine-driven blowers. Mare Island, Cal., Schedule 8575—one fire-tube vertical steam boiler. Brooklyn, N. Y., Schedule 8597—28 spur-geared chain hoists; Schedule 8601—two electrically heated sterilized outfits; Schedule 8608—21,500 lb. seamless drawn-brass pipe, 1900 lb. seamless drawn-copper tubing, 2820 composition unions; Schedule 8605—20,800 ft. standard-weight wrought pipe; Schedule 8603—miscellaneous seamless-drawn copper pipe. Puget Sound, Wash., Schedule 8576—miscellaneous naval brass angles, miscellaneous brass plates. Charleston, S. C., Schedule 8608—1200 lb. soft-brass sheets, miscellaneous soft-copper sheets; Schedule 8605—10,100 ft. galvanized wrought pipe. Boston, Mass., Schedule 8606—4800 ft. flexible voice tubing. Bids will also be received until Aug. 17 as follows: Boston, Mass., Schedule 8577—furnishing and installing one refrigerating plant. Mare Island, Cal., Schedule 8598—miscellaneous indicators, annunciators, pumps, etc.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Foreign and Domestic Commerce in the Commerce Reports as follows: No. 17,422—Tenders are invited for furnishing and delivering at site in Melbourne, Aus., to be submitted before Aug. 11, one 1000-kw. direct-current generator with field regulator and accessories, one liquid starter with accessories, together with one spare set of carbon brushes and one spare field coil for generator. Tender forms with specifications may be obtained from McIlwraith, McEachard & Co., agents for the Melbourne City Council, Billiter Square Buildings, London, E. C., Eng. Tenders should be addressed to the chairman of the electric supply committee, Town Hall, Melbourne. The bureau has no further particulars. No. 17,428—This bureau is in receipt of a letter from a manufacturing firm in the United States stating that one of its correspondents desires to be placed in touch with electric bicycles and accessories. No. 17,433—An American consular officer in Brazil transmits the name and address of a firm of commission merchants which has indicated a desire to receive descriptive literature, etc., relative to small pocket electric flashlamps. No. 17,453—An American consular officer in England reports that a firm in his district desires to communicate with American manufacturers of heat-resisting inner and outer globes for arc lamps. No. 17,470—An American consular officer writes that a demand is being made that the system for lighting passenger coaches on the state railways by gas be changed to electricity. The consular officer transmits the name and address of an official of the railroad who may be addressed relative to this opportunity. No. 17,478—An American consular officer in Canada reports that an electric-power company in his district is in need of meter clocks which will automatically charge power to the consumer at the regular lighting rate during the rush period and at a reduced rate for cooking purposes at other times. No. 17,482—An American consular officer in Brazil reports that many new houses and buildings are being constructed in his district and he desires to receive catalogs, price lists, etc., for elevators of simple mechanism. No. 17,546—An American consular officer in England reports that a corporation in his district is in the market for 8-in. or 9-in. opal shades, arc-lamp globes, and both alternating and direct-current motors for generating industrial service. No. 17,548—The *Gaceta de Madrid* publishes a notice to the effect that tenders will be received at the Direccion General de Obras Publicas, Madrid, Spain, until Aug. 3 for the construction and operating for a period of 60 years of an electric tramway between Deusto and Ibarrecolanda in the Province of Vizcaya. The minimum rolling stock required to begin with is two

motor tramcars, two trailers, one motor wagon and one trailer wagon. An option on the concession is held by the Compania Vizcaina de Electricidad. The bureau has no further information relative to this.

North Central

ADRIAN, MICH.—The Electric Light and Water Department has purchased and will install within the next 30 days a 120-hp. Skinner engine.

LAPEER, MICH.—The Lapeer Gas-El. Co. has taken over the two power plants of the Schlegel Extension Pwr. Co. of Lapeer, one plant being in the city and the other just south of Lapeer. The entire system is to be connected with the Lapeer company's plant and will be put on a 24-hour service.

ST. CLAIR, MICH.—The City Council has authorized the Board of Public Works to purchase a new generator for the municipal electric-light plant, for which it is understood bids will soon be asked.

YPSILANTI, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 20, for construction, including mechanical equipment and approaches, of the United States post office at Ypsilanti. Drawings and specifications may be obtained at the above office or from the custodian of site at Ypsilanti.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, until July 30 for transformers for the Municipal Electric Light Department. Specifications may be obtained at the office of the commissioner of light and heat division, 1443 East Third Street.

CLEVELAND, OHIO.—Plans have been filed at the Builders' Exchange by the board of education of Cleveland Heights for estimates of cost of construction for a central power plant to be erected on the schoolhouse grounds on Lee Road, such of Mayfield Road, under the supervision of Walker & Weeks, architects.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, 511 City Hall, Cleveland, until July 30 for paper-insulated, lead-covered cable for the Municipal Electric Light Department. Specifications may be obtained at the office of the commissioner of purchases and supplies, 1443 East Third Street.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, 511 City Hall, Cleveland, until July 28 for water-tube boilers for the Division Avenue pumping station, Department of Public Utilities. Specifications may be obtained of the commissioner of water, 413 Superior Avenue, City Hall.

EAST YOUNGSTOWN, OHIO.—Bids will be received by the village of East Youngstown, City Building, East Youngstown, until Aug. 2 for furnishing and operating a new and complete electric-lighting system for periods of two, five, eight and ten years, in accordance with specifications and drawings on file at the office of the village clerk, City Building, East Youngstown, and at the office of H. Whitford Jones & Co., engineers, Citizens' Building, Cleveland. C. R. Anderson is village clerk.

FREMONT, OHIO.—We are informed that H. Whitford Jones & Co., Citizens' Building, Cleveland, have not been engaged to prepare plans for the installation of an electric-lighting system in Fremont, as stated in the issue of July 3.

GREEN SPRING, OHIO. — The Green Spring El. Lt. & Pwr. Co. is contemplating purchasing electrical energy from some outside source, possibly from the municipal plant at Clyde. In such an event the company would erect 5 miles of three-phase, 60-cycle, 6600-volt transmission line and would be in the market for material for same; the present generating equipment would also be for sale. D. M. Scott is general manager.

LIMA, OHIO.—The Standard Pwr. & Equipment Co. is reported to have purchased of the Western Ohio R. R. Co. of Lima nine small electric and railway companies operating in northwestern Ohio, with a view to rebuilding and combining the plants under a single management. Plants will be operated in Lucas, Wood, Hancock, Allen, Auglaize, Shelby, Miami, Montgomery and Mercer Counties.

MARION, OHIO.—A petition has been presented to the City Council asking for the installation of an ornamental lighting system (cluster lamps) on West Center Street, from Oak Street to Davids Street.

NEW BERLIN, OHIO.—Bids will soon be asked for furnishing electricity for lighting the streets of the village. The Canton El. Co. of Canton supplies electrical service to private residences and factories in New Berlin.

SPRINGFIELD, OHIO.—An agreement has been reached between the City Council and the Springfield Ry. Co. whereby the latter will place its feed wires on Main Street in underground conduits.

WASHINGTON C. H., OHIO.—The city officials have engaged H. Whitford Jones & Co., Citizens' Building, Cleveland, to prepare plans for a new street-lighting system here.

WILMINGTON, OHIO.—Within the next six months the Dayton Pwr. & Lt. Co. will extend its transmission lines from Wilmington through Port William to Bowersville to supply electrical service in those villages. Step-up transformers with switching apparatus will be installed at the Wilmington power station, and substations with switching apparatus will be installed to supply the two villages. Complete distribution systems will be built in both villages to furnish electricity for commercial and residential service; also street-lighting systems, using 80-cp., type C tungsten lamps. F. C. Jeannot is superintendent of Wilmington district.

YOUNGSTOWN, OHIO.—J. McAlees, proprietor of the Albany Hotel, has announced his intention of installing an isolated electric generating plant for the purpose of supplying electricity for all purposes in connection with the hotel and also to enable the installation of ornamental lamps for the exterior. Other property owners are reported to be contemplating a similar action in consequence of the failure of the city to extend the ornamental street-lighting system as far as desired.

FULLERTON, KY.—John Davis, who has purchased the plant of the Fullerton Canning Co., it is reported, will install an electric-light plant and build an ice factory.

HAZARD, KY.—Plans are being considered by E. C. Lilly of Bluefield, Va., and D. Terpstra of Norton, Va., it is reported, for the construction of a large central electric generating plant to supply electricity for coal mines in the Hazard field.

HENDERSON, KY.—The Henderson Trac. Co. is reported to be considering improvements to its power plant.

HINDMAN, KY.—The proposal to issue $200,000 in bonds for the installation of a municipal electric-light and power plant in Hindman will soon be submitted to the voters.

LEBANON, KY.—Plans are being considered by local business men for the installation of an electric-light plant and ice factory. Arrangements, it is understood, have been made for the purchase of equipment.

LEXINGTON, KY.—Plans prepared for the Board of Commerce for the installation of an ornamental street-lighting system on the principal streets of the city will be examined by an expert before work is started. The property owners will bear the expense of installing a system consisting of ninety-seven standards carrying two lamps each, and the city will maintain the lamps and provide electricity for them.

INDIANAPOLIS, IND.—The Indianapolis Lt. & Ht. Co. has been granted a permit to build an addition to its plant at Eighteenth and Mill Street.

NORTH JUDSON, IND.—Within the next three months the North Judson El. Co. expects to erect ten miles of transmission line; also to purchase within the next two months material for above line and also material for connecting about 100 customers, including watt-hour meters and a series (type C) street-lighting system.

ELBURN, ILL.—Preparations are being made for the installation of a 50-hp Murray Corliss steam engine in the municipal electric-light plant. Contract has been awarded to the Murray Iron Works of Burlington, Iowa. A. A. Sharp is superintendent.

HOOPESTON, ILL.—The Hoopeston Gas & El. Co. is making extensive improvements to its property, including changing from gas engines back to steam engines. H. D. Heyden is manager.

ROCKFORD, ILL.—Bids will be received by the purchasing committee at the office of the superintendent of water department, Rockford, until July 27 for pumping equipment as follows: (1) The installation to be of a rotary type and to include a deep-well turbine pump combined with a booster centrifugal pump, directly connected to a vertical electric motor; also a horizontal booster centrifugal pump with motor, directly connected, and a remotely controlled automatic starting equipment for both motors with necessary switchboards and accessories. (2) The pump to be of reciprocating type and the equipment to include a deep-well plunger pump with power head belted to horizontal electric motor and remotely controlled automatic starting equipment for said motor and necessary switchboards and accessories. Copies of proposal forms and specifications may be obtained upon deposit of $5. Ross P. Beckstrom is superintendent.

TOULON, ILL.—The Toulon Lt. & Pwr. Co. expects to install a new switchboard and an additional 150-hp. boiler. This improvement is not contemplated in the immediate future.

DELAVAN, WIS.—Plans are being considered by the City Council for remodeling and enlarging the lighting system.

FARIBAULT, MINN.—The Consumers' Pwr. Co. of Faribault expects to extend its 13,200-volt transmission lines to serve the villages of Goodhue and Rosemount within the next few months. Street-lighting and water-pumping contracts have been secured in both places.

LYLE, MINN.—The Village Board expects to install a crude-oil engine before Oct. 1 in the municipal electric-light plant. N. T. Fortun is manager.

MANKATO, MINN.—Arrangements have been made by the Consumers' Pwr. Co. to extend its electric transmission lines to the suburb of Le Hillier within the next 30 days.

NEW PRAGUE, MINN.—Within the next four months the Municipal Electric Light and Water Department expects to purchase lamp posts and cable for street-lighting, covering a distance of ½ mile. Joseph T. Rynda is superintendent.

PARK RAPIDS, MINN.—B. Gunderson of Park Rapids is planning to install an electric-lighting system in Menahga. He proposes to build a plant at Hubbard (where there is already a dam and waterwheel), installing a three-phase, 60-cycle, 6000-volt generator and erecting a transmission line to Menahga and Sebeka, a distance of 17 miles from Hubbard. As yet definite plans have not been decided upon.

THIEF RIVER FALLS, MINN.—The city of Thief River Falls has taken an option on water rights and dam across the Red Lake River, known as the Kretzschmar estate property. The property has been offered to the city at $35,000.

BANCROFT, IOWA.—Bonds to the amount of $10,000 have been voted for the installation of a municipal electric-light plant.

CLINTON, IOWA.—The Clinton Gas & El. Co. has been granted a franchise to supply electrical service in Albany, Ill. The company is also contemplating extending its transmission lines to supply electricity for the Meredosia Swamp drainage project.

DE WITT, IOWA.—The property of the De Witt El. Lt. & Pwr. Co. has been purchased by the Iowa Ry., Lt. & Pwr. Co. of Cedar Rapids. The local plant will be closed down as soon as the high-tension transmission lines of the Iowa company are extended to De Witt.

MARATHON, IOWA.—A special election will be called to submit to the voters the proposal to establish an electric-light plant in Marathon.

THOMPSON, IOWA.—The contract for construction of the proposed municipal electric-light plant, it is reported, has been awarded to the Strong El. Co. of Des Moines.

CALIFORNIA, MO.—Within the next six months the California El. Lt. & Pwr. Co. expects to purchase one new 150-hp. boiler, one 60-hp. to 150-hp. Corliss engine (second-hand), and one 50-kw. to 150-kw., three-phase, 60-cycle, 2300-volt generator with exciter and switchboard. F. T. Porter is proprietor and manager.

CAMPBELL, MO.—The Campbell Public Ser. Co. expects to erect within the next two months an addition to its power house and to purchase a new boiler and Corliss steam engine or oil engine (has not decided which) and some poles. The company will also deal in all standard appliances. Benjamin F. Eicholtz has purchased the electric plant of the Campbell Mill & Lt. Co., and will operate it under the above name.

CASSVILLE, MO.—The Cassville Milling & Pwr. Co., it is reported, is contemplating the construction of a power house.

FARGO, N. D.—The City Commissioners and Park Board are considering the question of providing a better lighting system for Island Park.

BROKEN BOW, NEB.—The contract for the construction of the municipal electric-light plant and water-works system has been awarded to the Alamo Engine & Supply Co., of Omaha, at $15,546.

FULLERTON, NEB.—At a special election held recently the proposal to issue bonds for the installation of a municipal electric-light plant was defeated. An item published in the issue of July 10 stated that bonds to the amount of $28,000 were voted

to install a municipal electric plant. Arthur L. Leard is city clerk.

MAGNET, NEB.—P. J. Sandberg, owner of the local electric-light plant, expects to purchase within the next 12 months lightning arresters, meters and wires, washing machines, wiring supplies, switches, etc.

ORD, NEB.—Bids will be received by O. P. Cromwell, city clerk, Ord, until Aug. 13 for furnishing and installing a series incandescent street-lighting system and electrolier lighting system. Bids will also be received for furnishing and installing various electrical pumping equipment and power house in accordance with plans and specifications on file in the office of the city clerk, Ord, and at the office of Bruce & Standeven, engineers, Omaha. The cost of the work is estimated at $22,691.

OSCEOLA, NEB.—Within the next three months the Osceola & Shelby El. Lt., Ht. & Pwr. Co. expects to erect 6 miles of transmission lines, and to purchase electrical appliances sufficient to meet demands of customers. Clarence Miller is owner and manager.

SCHUYLER, NEB.—Within the next 12 months the water and light committee expects to purchase a 50-kw., three-wire, direct-current generator and steam engine to drive same. E. A. Schmid is manager.

CENTRALIA, KAN.—A new 50-kw. electric generating unit (directly connected), new generator and feed panels, boiler unit, wattmeters, etc., have recently been installed in the municipal electric-lighting plant. It is expected to supply electricity in Soldier and Goffs and other towns through a transmission line running to Corning. Within the next few months the electric-light commission excepts to purchase electric washing machines, vacuum cleaners, etc. D. A. Steiner is superintendent.

CLAFLIN, KAN.—The Claflin Tel., Lt. & Garage Co. expects to purchase switches to cut its bus into two sections so that the two units can be operated separately during the peak load and later thrown together to be fed from a single generator; also within the next two months to purchase 15 meters and wire as needed. E. H. Ruch is owner and manager.

ELKHART, KAN.—A petition is being circulated asking the Council to call a special election to vote on the proposal to issue bonds for the installation of a municipal electric-light plant and water-works system.

EVEREST, KAN.—At an election held recently bonds to the amount of $8,000 were authorized for the installation of an electric-light plant. Electricity will probably be obtained from the plant in Hiawatha or Atchison.

HAVILAND, KAN.—Bonds to the amount of $7,000 have been voted for the installation of a municipal electric-lighting plant in Haviland.

PARKER, KAN.—Bonds to the amount of $5,000 have been voted for the installation of a municipal electric-light plant. C. O. Conrad is city clerk.

Southern States

MADISON, N. C.—Contract, it is reported, has been awarded to W. D. Wilcox for the Salem Iron Works, Winston-Salem, for construction of a stone or concrete power house on Hogan's Creek. The proposed plant will have an output of 250 hp. and electricity will be transmitted to Mayodan and Madison, a distance of 4 miles. Company to operate plant has not yet been organized.

RALEIGH, N. C.—The installation of an ornamental lighting system in Raleigh is under consideration.

WARRENTON, N. C.—Bids will be received by the Mayor and Board of Commissioners, Town Hall, Warrenton, until Aug. 10 for the construction of water-works and sewerage system. The work will include two motor-driven triplex pumps, pumping station and collecting well, 2¼ miles of pole line, 75,000-gal. tower and tank, about 6½ miles of 6-in. and 8-in. cast-iron pipe lines, and 7½ miles of 8-in. to 15-in. pipe sewers. Plans and specifications are on file at the office of the secretary in Warrenton, and at the office of Gilbert C. White, engineer, Charlotte. Copies of specifications may be obtained upon application to the engineer, for which a deposit of $10 will be required.

COLUMBIA, S. C.—Plans are being prepared, it is reported, for the construction of power plant of 600 hp. (to cost about $50,000) for the State Hospital for the Insane. J. W. Rutherford is superintendent of hospital.

NICHOLLS, GA.—The Public Utility Co. of Waycross, it is reported, is contemplating the construction of an electric-light plant (50 kw.) and water-works system in Nicholls, to cost about $20,000.

FROSTPROOF, FLA.—Preparations are being made by C. J. Brusselle of Lakeland to install an electric-lighting plant in Frostproof. The equipment will consist of a 50-kw., three-phase, 60-cycle alternator directly connected to an oil engine, switchboard panel with oil switch and transformers, four miles of overhead lines, 150 meters of different sizes and ten arc lamps.

CLINTON, TENN.—The Clinton El. Lt. Co. has been reorganized and incorporated under the name of the Clinton El. Lt. & Pwr. Co., The capital stock is placed at $10,000. The company proposes to change its system from direct to alternating current, 60 cycles, 2300 volts, and to increase the output of the plant, which will require new equipment, including boilers, engine, generator, switchboard equipment, transformers, street-lighting system and about 30 hp. in motors. H. G. Amerine is superintendent.

JELLICO, TENN.—Plans are being prepared for the installation of an ornamental street-lighting system in Jellico, which provide for the erection of 100 lamp standards, carrying two-lamp and four-lamp clusters (100-cp. and 60-cp. tungsten lamps), maintained by overhead wires. The cost of the lighting system is estimated at $10,000; cost of municipal plant to supply street and commercial lighting is estimated at $25,000. F. C. Moore is chairman of lighting committee.

GUNTERSVILLE, ALA.—The Alabama Pwr. Co. of Birmingham is planning to build a steam-driven power plant in Guntersville. Later the company contemplates erecting a transmission line from Gadsden to Guntersville to furnish electrical service in Albertville, Boaz and other places along the line.

OKOLONA, MISS.—Two 150-hp. Walsh & Widner boilers are being installed in the municipal electric-light plant, and another 10-in. well is being bored. An additional air compressor will be installed at an early date.

OXFORD, MISS.—Bonds to the amount of $6,500 have been voted for improvements to the municipal electric-light plant.

RUSH, ARK.—John Conness Shepherd is reported to be contemplating the installation of an electric-lighting system at mining plant.

KAPLAN, LA.—At an election held recently bonds were voted to construct a municipal elecric-light plant and for improvements to water-works system.

RUSTON, LA.—The town of Ruston has recently purchased a 250-hp. Snow oil engine directly connected to a General Electric generator, one 1000-gal. per minute pump, De Laval Underwriter fire pump, a 375-gal. per minute centrifugal service pump (both motor-driven), 100-hp. variable-speed motor for driving air compressor, for the municipal electric-light plant. It is proposed to open a campaign for the sale of electrical appliances and supplies, especially cooking apparatus, about Sept. 1. R. H. Brooks is superintendent.

MUSKOGEE, OKLA.—A committee of five local citizens has been appointed by the Greater Muskogee Association to investigate the feasibility of building a dam across the Grand River between Muskogee and Fort Gibson to generate hydroelectric power, for which surveys and estimates of cost have been made. The dam as proposed will cost about $750,000.

WAUKOMIS, OKLA.—Within the next six months the Village Board will purchase one transformer for the municipal electric-lighting plant. S. U. Wren is president of the board.

WAURIKA, OKLA.—Within the next three months the Waurika Ice & El. Co. expects to erect a 90-ft. by 48-in. smokestack. Frank Beauman is general manager.

AUSTIN, TEX.—The Legislature has appropriated $125,000 for improvements at State Capitol, to include power and heating plant, rewiring and plumbing. E. T. Owens is superintendent of public buildings and grounds.

HARRISBURG, TEX.—The new cement mill of the Texas Portland Cement Co. to be erected in Harrisburg will be equipped for electrical operation.

HOUSTON, TEX.—Plans are being considered for extending the ornamental lighting system on Main Street out on Main Street Boulevard. Arc lamps erected on "gooseneck" posts, maintained by underground wires, will be used. Clarence George is city electrician.

ISABEL, TEX.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 28 for construction of brick power house and wood-frame quarters at the naval radio station, Isabel. Plans and specifications may be obtained on application to the bureau.

Pacific States

EVERETT, WASH.—The City Council has voted to call an election for Aug. 17 to submit the proposal to authorize the Council to make investigations necessary for the development of water-power on the Sultan River and construction of a municipal electric plant and transmitting electricity to Everett to be used for municipal and commercial purposes.

SEATTLE, WASH.—A recent report submitted to the Mayor and City Council by J. D. Ross, superintendent of lighting, recommends the purchase of the hydroelectric power plant of the Elwha Pwr. Co., situated on the Elwha River, about 100 miles from the city of Seattle. The present output of the plant is about 6000 kw., and the valuation is placed by the owners at about $200,000. In his report Mr. Ross advises the city not to acquire the property until the output of the plant is increased to 15,000 kw., which he estimates will cost about $500,000.

SPRAGUE, WASH.—The City Council is negotiating with the Washington Wtr. Pwr. Co. of Spokane relative to equipping the water-works pumping station for electrical operation. M. C. Osborne of Spokane is commercial agent of the company.

SUMNER, WASH.—Plans, it is reported, are being prepared for the installation of a new street-lighting system in Sumner this summer

WENATCHEE, WASH. — The Dryden power plant of the Wenatchee Valley Gas & El. Co. was recently damaged by a mud slide, causing a loss of about $7,000. Part of the power house was destroyed and some of the machinery carried into the river. Arthur Gunn is president.

PORTLAND, ORE.—According to announcements recently made by Acting Forester Buck of Portland, the Forestry Department, Washington, D. C., will erect approximately 438 miles of telephone lines in the government forests in Oregon and Washington. It is understood that all or a large portion of the work will be done this year.

SAN FRANCISCO, CAL.—The contract for lighting fixtures for the new City Hall building is reported to have been awarded to the Leo J. Meyberg Co., 47-49 Geary Street, San Francisco, for $32,915.

RICHLAND, IDAHO.—The Elec. Investment Co., which recently took over the property of the Idaho-Oregon Lt. & Pwr. Co. of Boise, it is reported, contemplates the erection of transmission lines in Eagle Valley. The company will also furnish electrical service in Richland and other small towns in this vicinity if franchises can be secured.

GREAT FALLS, MONT.—The Montana Pwr. Co. of Great Falls will soon begin work on the erection of a transmission line from Great Falls to Two Dot.

ROUNDUP, MONT. — An ordinance authorizing a special improvement district, providing for the installation of an ornamental lighting system, has been passed by the Council. Plans prepared by C. A. Renshaw, engineer, provide for the erection of 100 lamp standards, to cost $100 each.

MANASSA, COL.—Walter Ickles and associates, of Alamosa, it is reported, contemplate asking for a franchise to supply electricity in Manassa.

Canada

NORTH VANCOUVER, B. C.—Legal action has been taken by the municipality of North Vancouver to compel the Vancouver Pwr. Co. to sell its plant and franchise in that district to the city of North Vancouver. If the city wins the case and takes over the system, extensive improvements and extensions, it is said, will be made.

KENORA, ONT.—Preliminary surveys, it is reported, are being made for a proposed hydroelectric development in the western part of the town.

PETROLIA, ONT.—The installation of a hydroelectric system in Petrolia is under consideration.

MONTREAL, QUE.—Extensive improvements are contemplated by the Shawinigan Falls & Pwr. Co. and associated companies, which include the erection of a transmission line connecting the city of Quebec with Shawinigan, the installation of additional machinery which will increase the output of the Cedars Rapids plant from 10,000 hp. to 30,000 hp., the construction of a tramway for Three Rivers and its immediate district, and extensions to be carried out at the plants of both the Aluminum Co. and the Canada Carbide Co. J. E. Aldred, 24 Exchange Place, New York, N. Y., is president.

Miscellaneous

SEWARD, ALASKA.—Application has been made to the City Council by J. C. Murray and J. P. Mantell for a franchise to install and operate an electric light and power plant in Seward.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 2, for furnishing mechanical range indicators and patterns, steel, wrought-iron and steel pipe, fusible plugs, switch points, valves, steam whistles, sheet copper, engine lubricators, etc. Blanks and general information relating to this circular (No. 951) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

PANAMA.—Bids will be received at the office of the general purchasing agent, the Panama Canal, Washington, D. C., until Aug. 6, for furnishing electrically operated passenger elevator and dumbwaiter and hand-operated freight elevators, boiler tubes, steam cocks, portable tool stands, cold-rolled steel, tool steel, steel cable, etc. Blanks and general information relating to this circular (No. 955) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JULY 13, 1915.

[Prepared by Mitchell & Allyn, 41 Park Row, New York.]

1,145,901. ELECTRIC SIGNALING APPARATUS; O. G. H. E. Kehrhann, New Rochelle, N. Y. App. filed Dec. 4, 1913. Weatherproof, for ship and train signaling.

1,145,916. MEANS FOR SUPPORTING SHEAVES; O. B. Mueller, New Rochelle, N. Y., and D. H. Buell, Marietta, Ohio. App. filed July 15, 1910. For guiding cable into a pipe line.

1,145,941. FIRE-ALARM-TELEGRAPH SYSTEM; N. H. Suren, Needham, Mass. App. filed Feb. 2, 1914. Device in main controlling circuit for controlling local circuits containing signal-receiving instrument.

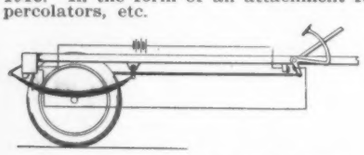
1,145,950. GALVANIC CELL; S. M. Ward, Jr., New York, N. Y. App. filed Sept. 30, 1911. High internal resistance; wet cell.

1,145,976. SUPERVISORY SYSTEM FOR TELEPHONE LINES; W. W. Dean, Chicago, Ill. App. filed June 15, 1903. For two-wire systems.

1,145,977. ELECTRIC HEATER; H. W. Denhard, Milwaukee, Wis. App. filed Oct. 17, 1910. Heating coil is movable relative to the cooking utensil.

1,145,978. TELEPHONIC TRANSMISSION CIRCUIT; H. G. Dorsey, East Orange, N. J. App. filed Sept. 7, 1912. Prevents disturbing noises in telephonic relay.

1,145,988. ELECTRIC HEATER; W. S. Hadaway, Jr., New Rochelle, and E. N. Lightfoot, New York, N. Y. App. filed Feb. 6, 1913. In the form of an attachment for percolators, etc.



1,146,588—Automatic Signal Lamp

1,146,002. TELEPHONE SYSTEM; E. Land, Grand Rapids, Mich. App. filed Nov. 25, 1904. Combination manual and automatic. (One hundred and sixteen claims.)

1,146,016. ELECTRIC-CIRCUIT-CONTROLLING SWITCH; E. Oppenheim and T. J. Burns, Rockford, Ill. App. filed May 7, 1913. Operated by a certain combination of keys.

1,146,019. VACUUM-PRODUCING METHOD AND MEANS; A. H. Pfund, Baltimore, Md. App. filed Feb. 26, 1914. Has an electrode of gas-absorbing charcoal.

1,146,040. TROLLEY HEAD; W. Volpe, Philadelphia, Pa. App. filed Aug. 17, 1914. Provided with two guard wheels.

1,146,049. TELEGRAPHY; W. M. Bruce, Jr., Springfield, Ohio. App. filed June 15, 1914. Even distribution of current in cables of high capacity.

1,146,064. ELECTRIC CIRCUIT-CONTROLLING SWITCH; W. E. Gorton, St. Joseph, Mo. App. filed June 10, 1914. Pressure-controlled; for air pumps, etc.

1,146,074. TELEPHONE-EXCHANGE SYSTEM; M. L. Johnson, Chicago, Ill., App. filed July 15, 1912. Electromagnetic switching mechanism.

1,146,075. PROCESS OF TREATING ZINC-BEARING MATERIALS; W. McA. Johnson, Hartford, Conn. App. filed June 27, 1913. Electrically heats charge in presence of molten iron.

1,146,082. AUTHORIZING METHOD AND SYSTEM; J. J. Leidigh, Milwaukee, Wis. App. filed Sept. 8, 1908. Operates authorizing mechanism to print tickets with uniform pressure in all departments.

1,146,084. ELECTRIC-CURRENT TAP; C. D. McLean and G. H. Holt, Berlin, N. H. App. filed May 16, 1914. Can be fitted into the present type of socket shells.

1,146,113. ACCOUNTING SYSTEM; C. H. Tallmadge, Chicago, Ill. App. filed May 21, 1909. For factories, etc.

1,146,118. ENTRANCE FITTING OR PIPE CAP FOR ELECTRIC-SERVICE PIPES OR CONDUITS; W. D. Woolley, St. Louis, Mo. App. filed Dec. 29, 1913. Interchangeably used with horizontal or vertical conduits.

1,146,140. MAGNETIC SEPARATION OF ORE; F. B. Dutton and B. E. McKechnie, Lebanon, Pa. App. filed April 2, 1912. Magnetic action on the ore is gradual.

1,146,141. MAGNETIC SEPARATOR; F. B. Dutton and B. E. McKechnie, Lebanon, Pa. App. filed April 2, 1912. Magnetic drum operates below water surface.

1,146,164. ELECTRICALLY HEATED APPARATUS; T. Hoock, Cologne-Bayenthal, Germany. App. filed Oct. 23, 1912. "Heat-storage" type.

1,146,167. CIRCUIT-BREAKER; D. B. Hughes, New York, N. Y. App. filed May 10, 1912. Contacts in chamber separate from cam.

1,146,172. VARIABLE-RATE INTEGRATING ELECTRICITY METER; V. Karapetoff, Ithaca, N. Y. App. filed April 1, 1912. Special electrode, magnetic and time-controlled devices.

1,146,177. TELEPHONE SYSTEM; E. Land, Grand Rapids, Mich. App. filed Feb. 13, 1905. Combination manual-automatic. (One hundred and seventeen claims.)

1,146,201. ELECTRIC-WIRE INSULATOR; S. Nunn, Portland, Ore. App. filed April 12, 1912. Wire slides through slot in insulator.

1,146,204. ELECTRIC-SIGNAL SWITCH; W. A. Pearce, Virginia, Minn. App. filed March 7, 1913. Operated by passing trolley.

1,146,212. COMPOUND FOR TREATING LUMBER; J. P. Sullivan, Memphis, Tenn. App. filed Oct. 28, 1914. Salt, bluestone, alum, indigo blue and water.

1,146,234. TELEGRAPHY; W. M. Bruce, Jr., Springfield, Ohio. App. filed May 21, 1914. Submarine.

1,146,274. PRINTING-TELEGRAPH APPARATUS; F. D. Pearne, Chicago, Ill. App. filed Sept. 3, 1907. Rapid sending apparatus. (Seventy-six claims.)

1,146,292. THERAPEUTICAL ELECTRODE; R. H. Wappler, New York, N. Y. App. filed March 16, 1915. Non-vacuum compound.

1,146,298. INSULATING SUPPORT FOR STORAGE BATTERIES; C. Ambruster, Roslyn, Pa. App. filed June 14, 1913. Adjustable, to compensate for inequalities in floor, etc.

1,146,310. ELECTRICALLY HEATED APPARATUS; O. A. Colby, Wilkinsburg, Pa. App. filed Jan. 15, 1913. Has molten mass which can be forced up into the hot plates.

1,146,325. CONNECTING DEVICE; D. D. Gordon, Chicago, Ill. App. filed Feb. 28, 1913. Attachment-plug construction.

1,146,326. SWITCHING DEVICE; D. D. Gordon, Chicago, Ill. App. filed Oct. 5, 1911. Pendent; rotary turn.

1,146,328. ELECTRICALLY HEATED APPARATUS; T. Hoock, Cologne-Bayenthal, Germany. App. filed Oct. 23, 1912. Range and oven construction.

1,146,329. ELECTRICALLY HEATED APPARATUS; T. Hoock, Cologne-Bayenthal, Germany. App. filed Oct. 23, 1912. Hot plates of the range and oven may be utilized for various purposes.

1,146,330. ELECTRICALLY HEATED APPARATUS; T. Hoock, Cologne-Bayenthal, Germany. App. filed Oct. 23, 1912. Cooking vessel can be supported on the heat-storage body.

1,146,340. REMOTE-CONTROL SWITCH; W. S. Mayer, Taunton, Mass. App. filed Dec. 19, 1914. One switch coil placed within the other.

1,146,348. ELECTRICAL CONDUCTOR; F. H. Pritchard, Schenectady, N. Y. App. filed July 2, 1914. Divided into a large number of sections to reduce eddy currents.

1,146,371. COMPUTING MACHINE; J. N. Thornton, Jersey City, N. J. App. filed Aug. 17, 1911. Power drive. (Forty-one claims.)

1,146,486. ELECTRICAL INSTRUMENT FOR ELECTRICALLY TRANSMITTING INDICATIONS; M. Dürr, Friedenau, Berlin, Germany. App. filed Aug. 26, 1913. Pointer is mechanically operated; manometer, etc.

1,146,498. ARC LIGHT; G. Humber, Denver, Col. App. filed May 6, 1914. Improved converging carbon feed.

1,146,518. ELECTRIC RESISTANCE ELEMENT; J. R. Quain, London, Eng. App. filed July 11, 1914. Resistance inclosed in hollow silica support.

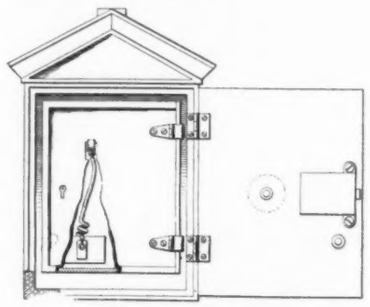
1,146,535. SOUND-TRANSMITTING MEMBER; L. Steinberger, New York, N. Y. App. filed June 23, 1911. Strengthened receiver of better acoustical properties.

1,146,574. CONTROLLER FOR AUTOMATIC MUSICAL INSTRUMENTS; A. Jameson, Indianapolis, Ind. App. filed Jan. 30, 1911. Can be held in the hand of the singer.

1,146,581. SYNCHRONOUS TELEGRAPHY; E. W. Larsen, Minneapolis, Minn. App. filed Nov. 9, 1912. Stable, non-oscillatory system.

1,146,583. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; F. R. McBerty, Antwerp, Belgium. App. filed Sept. 13, 1912. Automatic switching apparatus. Forty-eight claims.)

1,146,588. AUTOMOBILE SIGNAL LIGHT; J. F. Miller and C. J. Locke, Detroit, Mich. App. filed Jan. 30, 1915. Controlled by clutch or brake pedal.



1,146,616—Safety Device for Electric Signaling Apparatus

1,146,592. RESISTANCE; E. F. Northrop, Princeton, N. J. App. filed Jan. 9, 1915. Plurality of flat, spirally wound coils superposed, oppositely wound and connected in parallel.

1,146,616. SAFETY DEVICE FOR ELECTRIC SIGNALING APPARATUS; A. C. Farrand, Atlantic City, N. J. App. filed March 11, 1914. Grounds and insulates the parts to prevent danger to person operating call box.

1,146,623. ELECTRICALLY HEATED APPARATUS; T. Hoock, Cologne-Bayenthal, Germany. App. filed Oct. 23, 1912. Maintains different intensities of heat in a range.

1,146,628. PORTABLE ELECTRIC LIGHT; I. Koretzky, New York, N. Y. App. filed June 29, 1914. Circuit-closer can be set to maintain flashlamp "on."

1,146,637. THERMOSTAT; R. F. Massa, Fort Wayne, Ind. App. filed Nov. 11, 1913. Special arrangement of magnetic field armature and contact members.

1,146,661. TROLLEY POLE; C. O. Shaub, Dayton, Ohio. App. filed April 28, 1914. Spring-pressed guards for trolley wheel.

1,146,717. INSULATOR FOR HIGH-VOLTAGE ELECTRIC CABLE SPLICES; F. Klenk, Mount Vernon, N. Y. App. filed Feb. 6, 1914. Coupling with insulating cone.

1,146,734. ELECTROMAGNETIC CIRCUIT-CLOSING AND CIRCUIT-BREAKING DEVICE; A. Pick, Cleveland, Ohio. App. filed Oct. 16, 1911. Push-button control.

1,146,752. TELEGRAPHY; P. B. Delany, South Orange, N. J. App. filed Dec. 29, 1909. Automatic; perforated tape; high speed.

1,146,758. CURLING-IRON HEATER; W. S. Hadaway, Jr., New Rochelle, N. Y. App. filed Oct. 10, 1913. Circuit completed by insertion of trolley line.